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FEDERAL AVIATION ADMINISTRATION

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BURMA	RANGOON
CANADA	OTTAWA
CAPE VERDE ISLANDS	AMILCAR CABRAL
CHILE	SANTIAGO
CHINA	BEIJING
CHINA (FORMOSA)	TAIPEI
COLOMBIA	BOGOTA
CUBA	HAVANA
CYPRUS	NICOSIA
CZECHOSLOVAKIA	PRAGUE
DENMARK	COPENHAGEN
DOMINICAN REPUBLIC	SANTO DOMINGO
ECUADOR	GUAYAQUIL
ENGLAND	LONDON
ETHIOPIA	ADDIS ABABA
EYGPT	CAIRO
FIJI	NANDI
FINLAND	HELSINKI
FRANCE	PARIS
FRENCH POLYNESIA	TAHITI
GERMANY (EAST)	BERLIN
GERMANY (WEST)	FRANKFURT
GHANA	ACCRA
GREECE	ATHENS
GREENLAND	SONDRE STROMFJORD
GUYANA	GEORGETOWN
HAITI	PORT-AU-PRINCE
HONDURAS	TEQUCIGALPA
HONG KONG	HONG KONG
HUNGARY	BUDAPEST
ICELAND	REYKJAVIK
INDIA	BOMBAY
INDIA	CALCUTTA
INDIA	DELHI
INDIA	MADRAS
INDONESIA	JAKARTA
IRAN	TEHRAN (NOT AVBL)
IRELAND	SHANNON
ISRAEL	TEL AVIV
ITALY	ROME
JAMAICA	KINGSTON
JAPAN	TOKYO
JORDAN	AMMAN
KENYA	NAIROBI
KOREA (SOUTH)	SEOUL
KUWAIT	KUWAIT
LEBANON	BEIRUT
LIBERIA	ROBERTS
LIBYA	TRIPOLI
MALAYSIA	KUALA LUMPUR
MALTA	LUQA
MAURITIUS	PLAISANCE
MEXICO	MEXICO CITY
MOROCCO	CASABLANCA
MOZAMBIQUE	MAPUTO
NAURU ISLAND	NAURU
NETHERLANDS	AMSTERDAM
NETHERLANDS ANTILLES	CURACAO
NEW GUINEA	PORT MOSEBY
NEW ZEALAND	AUCKLAND
NIGERIA	LAGOS
NORWAY	OSLO
PAKISTAN	KARACHI
PANAMA	TOCUMEN
PARAGUAY	ASUNCION
PERU	LIMA
PHILLIPINES	MANILLA
POLAND	WARSAW
PORTUGAL	LISBON
ROMANIA	BUCHAREST
SAMOA	FALEOLA
SAUDI ARABIA	JEDDAH
SENEGAL	DAKAR
SEYCHELLES	MAHE
SINGAPORE	SINGAPORE
SOLOMON ISLANDS	HONIARA
SOUTH AFRICA	JOHANNESBURG
SOVIET UNION	MOSCOW
SPAIN	MADRID
SRI LANKA	COLOMBO
SUDAN	KHARTOUM
SURINAME	PARAMARIBO
SWEDEN	STOCKHOLM
SWITZERLAND	ZURICH
SYRIA	DAMASCUS
TANZANIA	DAR-ES-SALAAM
THAILAND	BANKOK
TRINIDAD	PORT OF SPAIN
TUNISIA	TUNIS
TURKEY	ANKARA
URUGUAY	MONTEVIDEO
VENEZUELA	CARACAS
YUGOSLAVIA	BELGRADE
ZAIRE	KINSHASA
ZAMBIA	LUSAKA
ZIMBABWE	HARARE

1.7 Pre-Flight Information Service at Aerodromes Available to International Flights.

Pre-Flight Information Units in the U.S. are either FAA operated Flight Service Stations (FSS) or National Weather Service operated Weather Service Offices (WS).

1.7.1 Flight Service Stations (FSSs) are air traffic facilities which provide pilot briefings, en route communications and VFR search and rescue services, assist lost aircraft and aircraft in emergency situations, relay ATC clearances, originate Notices to Airmen, broadcast aviation weather and National Airspace System (NAS) information, receive and process IFR flight plans, and monitor NAVAIDS. In addition, at selected locations FSSs provideEn Route Flight Advisory Service (Flight Watch), take weather observations, issue airport advisories, and advise Customs and Immigration of transborder flights.

1.7.1.1 Supplemental Weather Service Locations (SWSLs) are airport facilities staffed with contract personnel who take weather observations and provide current local weather to pilots via telephone or radio. All other services are provided by the parent FSS.

1.7.1.2 Flight Service Station (FSS) locations, services and telephone information are available in the U.S. Airport/Facility Directory, Supplement Alaska and Pacific Chart Supplement.

1.7.1.3 Flight Service Station, Pre-Flight information service coverage is designed primarily to provide service within a 500 mile area of the Flight Service Station. All Flight Service Stations, nevertheless, do have telecommunications access to all of the weather and NOTAM information available, on an as needed basis, for preflight briefing to international locations with which the U.S. International NOTAM office exchanges information.

1.7.1.4 A toll-free telephone service, 1-800-WX-BRIEF (1-800-992-7433), accessible from any telephone in the Bahamas Islands, is maintained by the Miami, Florida, International Flight Service Station (IFSS) for such flight services as air defense identification zone (ADIZ) and U.S. Customs Service information and requirements, weather briefings, and flight planning. Miami IFSS also maintains a remote communications outlet, frequency 118.4 MHz, on New Providence Island for en route services to aircraft in flight.

1.7.2 National Weather Service offices provide meteorological briefing services and flight documentation only. Services are provided on request. Weather Services offices are located at each of the following aerodromes serving international civil aviation:

Associated City	*State*
Phoenix	Arizona
Tucson	Arizona
Fresno	California
Los Angeles	California
Oakland	California
San Diego	California
San Francisco	California
Windsor Locks/Bradley	Connecticut
Washington	District of Columbia
Miami	Florida
Tampa	Florida
West Palm Beach	Florida
Chicago	Illinois
Indianapolis	Indiana
New Orleans	Louisiana
Baltimore	Maryland
Boston	Massachusetts
Detroit	Michigan
Minneapolis	Minnesota
St. Louis	Missouri
Las Vegas	Nevada
Newark	New Jersey
New York	New York
Syracuse	New York
Cleveland	Ohio
Portland	Oregon
Philadelphia	Pennsylvania
Pittsburgh	Pennsylvania
Corpus Christi	Texas
Dallas	Texas
El Paso	Texas
Houston	Texas
San Antonio	Texas
Seattle	Washington
Spokane	Washington
Milwaukee	Wisconsin
Anchorage	Alaska
Cold Bay	Alaska
Fairbanks	Alaska
Hilo	Hawaii
Honolulu	Hawaii
Kahului	Hawaii
San Juan	Puerto Rico
Pago Pago	Am. Samoa

2. SUMMARY OF NATIONAL REGULATIONS

2.1 Air Regulations for the United States and areas under its jurisdiction are published in parts entitled the Federal Aviation Regulations (FAR). It is essential that persons engaged in air operations in the U.S. airspace be acquainted with the relevant regulations. Copies of the FAR parts may be purchased from the:

Superintendent of Documents
U.S. Government Printing Office
North Capitol Street, NW
Washington, D.C. 20402

2.2 The following is a partial list of FAR Parts and their Respective subject matter:

FAR part No.	Title
1	Definitions and Abbreviations
11	General Rule-Making Procedures
13	Investigation and Enforcement Procedures
21	Certification Procedures for Products and Parts
23	Airworthiness Standards: Normal, Utility, and Acrobatic Category Airplanes
25	Airworthiness Standards: Transport Category Airplanes
27	Airworthiness Standards: Normal Category Rotorcraft
29	Airworthiness Standards: Transport Category Rotorcraft
31	Airworthiness Standards: Manned Free Balloons
33	Airworthiness Standards: Aircraft Engines
35	Airworthiness Standards: Propellers
36	Noise Standards: Aircraft Type and Airworthiness Certification
37	Technical Standard Order Authorizations
39	Airworthiness Directives
43	Maintenance, Preventive Maintenance, Rebuilding, and Alteration
45	Identification and Registration Marking
47	Aircraft Registration
49	Recording of Aircraft Titles and Security Documents
61	Certification: Pilots and Flight Instructors
63	Certification: Flight Crewmembers Other Than Pilots
65	Certification: Airmen Other Than Flight Crewmembers
67	Medical Standards and Certification

FAR part No.	Title
71	Designation of Federal Airways, Controlled Airspace, and Reporting Points
73	Special Use Airspace
75	Establishment of Jet Routes and Area High Routes
77	Objects Affecting Navigable Airspace
91	General Operating and Flight Rules
93	Special Air Traffic Rules and Airport Traffic Patterns
95	IFR Altitudes
97	Standard Instrument Approach Procedures
99	Security Control of Air Traffic
101	Moored Balloons, Kites, Unmanned Rockets and Unmanned Free Balloons
105	Parachute Jumping
107	Airport Security
108	Airplane Operator Security
109	Indirect Air Carrier Security
121	Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large Aircraft
123	Certification and Operations: Air Travel Clubs Using Large Airplanes
125	Certification and Operations Airplanes having a Seating capacity of 20 or More Passengers Or a Maximum Payload Capacity of 6,000 pounds or More.
127	Certification and Operations of Scheduled Air Carriers with Helicopters
129	Operations of Foreign Air Carriers
133	Rotorcraft External-Load Operations
135	Air Taxi Operators and Commercial Operators of Small Aircraft
137	Agricultural Aircraft Operations
139	Certification and Operations: Land Airports Serving Certain Air Carriers
141	Pilot Schools
143	Ground Instructors
145	Repair Stations
147	Aviation Maintenance Technician Schools
149	Parachute Lofts
150	Airport Noise Compatibility Planning
151	Federal Aid to Airports
152	Airport Aid Program
153	Acquisition of U.S. Land for Public Airports
154	Acquisition of U.S. Land for Public Airports Under the Airport and Airway Development Act of 1970.
155	Release of Airport Property from Surplus Property Disposal Restrictions
157	Notice of Construction, Alteration, Activation, and Deactivation of Airports
159	National Capital Airports
169	Expenditure of Federal Funds for Nonmilitary Airports or Air Navigation Facilities Thereon
171	Non-Federal Navigation Facilities
183	Representatives of the Administrator
185	Testimony by Employees and Production of Records in Legal Proceedings and Service of Legal Process and Pleadings
187	Fees
189	Use of Federal Aviation Administration Communications System
191	Withholding Security Information From Disclosure Under the Air Transportation Security Act of 1974.

3. DIFFERENCES FROM ICAO STANDARDS, RECOMMENDED PRACTICES AND PROCEDURES

See AIP Section DIF

4. ABBREVIATIONS

A list of abbreviations which are used in this AIP, the International Notices to Airmen, Notices to Airmen publication and International NOTAMs Class I, which differ from the ICAO abbreviations, is contained on page GEN 2-1.

Note: U.S. uses the terms "abbreviations" and "contractions" interchangeably.

5. UNITS OF MEASUREMENT

The following table identifies the units of measurement that have been selected for use in messages transmitted by all U.S. aeronautical stations, in the U.S. AIP, NOTAM dissemination, and other publications.

Measurements of	*Units in Blue Table*
Distance used in navigation, position reporting, etc. — generally in excess of 2 to 3 nautical miles	Nautical miles and tenths
Relatively short distances such as those relating to aerodrome (e.g., runway lengths).	Feet
Altitudes, elevations and heights.	Feet
Horizontal speed, including wind speed	Knots
Vertical speed.	Feet per minute
Wind direction for landing and taking off.	Degrees magnetic
Wind direction except for landing and taking off.	Degrees true
Visibility, including runway visual.	Statute miles or feet
Altimeter Setting.	Inches
Temperature.	Degrees Fahrenheit
Weight	Pounds
Time.	Hours and minutes, the day of 24 hours beginning at midnight Coordinated Universal Time

6. TIME SYSTEM

6.1 Coordinated Universal Time (UTC) is used in the Air Traffic and Communication services provided and in most documents published by the Aeronautical Information Services.

6.2 When local mean time is used, it will be so indicated as local standard time (LST). See GEN 2-2 for a depiction of the standard time zones within the continental United States.

7. NATIONALITY AND REGISTRATION MARKS

The nationality mark for the aircraft registered in the U.S. is the letter N, followed by a series of number or a series of numbers and letters.

8. SPECIAL EQUIPMENT TO BE CARRIED ON AIRCRAFT

Commercial air transport aircraft operating in the U.S. airspace must adhere to the provisions of Annex 6 — Operation of Aircraft, Part One, chapter six (Airplane Instruments, Equipment and Flight Documents) and chapter seven (Airplane Communications and Navigation Equipment).

9. MISCELLANEOUS INFORMATION

9.1 Commercial air transport operators in the United States must adhere to ANNEX 6 — Operation of Aircraft with the proviso that aircraft which have no operators' local representative available to them will be required to carry a fixed fuel reserve of not less than 45 minutes at the approved fuel consumption rate plus a variable reserve equivalent to 15% of the fuel required from departure to destination and to an alternate if an alternate is required; or where the reserve calculated in accordance with the above exceeds two hours at the approved fuel consumption rate — two hours reserve fuel.

10. MEDICAL FACTS FOR PILOTS

10.1 FITNESS FOR FLIGHT

10.1.1 Medical Certification

10.1.1.1 All pilots except those flying gliders and free air balloons must possess valid medical certificates in order to exercise the privileges of their airman certificates. The periodic medical examinations required for medical certification are conducted by designated Aviation Medical Examiners, who are physicians with a special interest in aviation safety and training in aviation medicine.

10.1.1.2 The standards for medical certification are contained in Part 67 of the Federal Aviation Regulations. Pilots who have a history of certain medical conditions described in these standards are mandatorily disqualified from flying. These medical conditions include a personality disorder manifested by overt acts, a psychosis, alcoholism, drug dependence, epilepsy, an unexplained disturbance of consciousness, myocardial infarction, angina pectoris and diabetes requiring medication for its control. Other medical conditions may be temporarily disqualifying, such as acute infections, anemia, and peptic ulcer. Pilots who do not meet medical standards may still be qualified under special issuance provisions or the exemption process. This may require that either additional medical information be provided or practical flight tests be conducted.

10.1.1.3 Student pilots should visit an Aviation Medical Examiner as soon as possible in their flight training in order to avoid unnecessary training expenses should they not meet the medical standards. For the same reason, the student pilot who plans to enter commercial aviation should apply for the highest class of medical certificate that might be necessary in the pilot's career.

CAUTION: The federal Aviation Regulations prohibit a pilot who possesses a current medical certificate from performing crewmember duties while the pilot has a known medical condition or increase of a known medical condition that would make the pilot unable to meet the standards for the medical certificate.

10.1.2 Illness

10.1.2.1 Even a minor illness suffered in day-to-day living can seriously degrade performance of many piloting tasks vital to safe fight. Illness can produce fever and distracting symptoms that can impair judgment, memory, alertness, and the ability to make calculations. Although symptoms from an illness may be under adequate control with a medication, the medication itself may decrease pilot performance.

10.1.2.2 The safest rule is not to fly while suffering from any illness. If this rule is considered too stringent for a particular illness, the pilot should contact an Aviation Medical Examiner for advice.

10.1.3 Medication

10.1.3.1 Pilot performance can be seriously degraded by both prescribed and over-the-counter medications, as well as by the medical conditions for which they are taken. Many medications, such as tranquilizers, sedatives, strong pain relievers, and cough-suppressant preparations, have primary effects that may impair judgment, memory, alertness, coordination, vision, and the ability to make calculations. Others, such as antihistamines, blood pressure drugs, muscle relaxants, and agents to control diarrhea and motion sickness, have side effects that may impair the same critical functions. Any medication that depresses the nervous system, such as a sedative, tranquilizer or antihistamine, can make a pilot much susceptible to hypoxia (see below).

10.1.3.2 The Federal Aviation Regulations prohibit pilots from performing crewmember duties while using any medication that affects the faculties in any way contrary to safety. The safest rule is not to fly as a crewmember while taking any medication, unless approved to do so by the FAA.

10.1.4 Alcohol

10.1.4.1 Extensive research has provided a number of facts about the hazards of alcohol consumption and flying. As little as one ounce of liquor, one bottle of beer, or four ounces of wine can impair flying skills, with the alcohol consumed in these drinks being detectable in the breath and blood at least three hours. Even after the body completely destroys a moderate amount of alcohol, a pilot can still be severely impaired for many hours by hangover. There is simply no way of increasing the destruction of alcohol or alleviating a hangover. Alcohol also renders a pilot much more susceptible to disorientation and hypoxia (see below).

10.1.4.2 A consistently high alcohol-related fatal aircraft accident rate serves to emphasize that alcohol and flying are a potentially lethal combination. The Federal Aviation Regulations prohibit pilots from performing crewmember duties within eight hours after drinking any alcoholic beverage or while under the influence of alcohol. However, due to the slow destruction of alcohol, a pilot may still be under the influence eight hours after drinking a moderate amount of alcohol. Therefore, an excellent rule is to allow at least 12 to 24 hours between "bottle and throttle." depending on the amount of alcoholic beverage consumed.

10.1.5 Fatigue

10.1.5.1 Fatigue continues to be one of the most treacherous hazards to flight safety, as it may not be apparent to a pilot until serious errors are made. Fatigue is best described as either acute (short-term) or chronic (long-term).

10.1.5.2 A normal occurrence of everyday living, acute fatigue is the tiredness felt after long periods of physical and mental strain, including strenuous muscular effort, immobility, heavy mental workload, strong emotional pressure, monotony, and lack of sleep. Consequently, coordination and alertness, so vital to safe pilot performance, can be reduced. Acute fatigue is prevented by adequate rest and sleep, as well as regular exercise and proper nutrition.

10.1.5.3 Chronic fatigue occurs when there is not enough time for full recovery between episodes of acute fatigue. Performance continues to fall off, and judgment becomes impaired so that unwarranted risks may be taken. Recovery from chronic fatigue requires a prolonged period of rest.

10.1.6 Stress

10.1.6.1 Stress from the pressures of everyday living can impair pilot performance, often in very subtle ways. Difficulties, particularly at work, can occupy thought processes enough to markedly decrease alertness. Distraction can so interfere with judgment that unwarranted risks are taken, such as flying into deteriorating weather conditions to keep on schedule. Stress and fatigue (see above) can be an extremely hazardous combination.

10.1.6.2 Most pilots do leave stress "on the ground." Therefore when more than usual difficulties are being experienced, a pilot should consider delaying flight until these difficulties are satisfactorily resolved.

10.1.7 Emotion

10.1.7.1 Certain emotionally upsetting events, including a serious argument, death of a family member, separation or divorce, loss of job and financial catastrophe, can render a pilot unable to fly an aircraft safely. The emotions of anger, depression, and anxiety from such events not only decrease alertness but also may lead to taking risks that border on self-destruction. Any pilot who experiences an emotionally upsetting event should not fly until satisfactorily recovered from it.

10.1.8 Personal Checklist

10.1.8.1 Aircraft accident statistics show that pilots should be conducting preflight checklists on themselves as well as their aircraft, for pilot impairment contributes to many more accidents than failure of aircraft systems. A personal checklist that can be easily committed to memory, which includes all of the categories of pilot impairment discussed in this section, is being distributed by the FAA in form of a wallet-sized card.

PERSONAL CHECKLIST

I'm physically and mentally safe to fly.
Not being impaired by:

I llness,
M edication,
S tress,
A lcohol,
F atigue,

PERSONAL CHECKLIST—Continued

I'm physically and mentally safe to fly.
Not being impaired by:

E motion.

10.2 EFFECTS OF ALTITUDE

10.2.1 Hypoxia

10.2.1.1 Hypoxia is a state of oxygen deficiency in the body sufficient to impair functions of the brain and other organs. Hypoxia from exposure to altitude is due only to the reduced barametric pressures encountered at altitude, for the concentration of oxygen in the atmosphere remains about 21 percent from the ground out to space.

10.2.1.2 Although a deterioration in night vision occurs at a cabin pressure altitude as low as 5,000 feet, other significant effects of altitude hypoxia usually do not occur in the normal healthy pilot below 12,000 feet. From 12,000 to 15,000 feet of altitude, judgment, memory, alertness, coordination and ability to make calculations are impaired, and headache, drowsiness, dizziness and either a sense of well-being (euphoria) or belligerence occur. The effects appear following increasingly shorter periods of exposure to increasing altitude. In fact, pilot performance can seriously deteriorate within 15 minutes at 15,000 feet.

10.2.1.3 At cabin pressure altitudes above 15,000 feet, the periphery of the visual field grays out to a point where only central vision remains (tunnel vision). A blue coloration (cyanosis) of the fingernails and lips develops. The ability to take corrective and protective action is lost in 20 to 30 minutes at 18,000 feet and 5 to 12 minutes at 20,000 feet, followed soon thereafter by unconsciousness.

10.2.1.4 The altitude at which significant effects of hypoxia occur can be lowered by a number of factors. Carbon monoxide inhaled in smoking or from exhaust fumes (see below), lowered hemoglobin (anemia), and certain medications can reduce the oxygen-carrying capacity of the blood to the degree that the amount of oxygen provided to body tissues will already be equivalent to the oxygen provided to the tissues when exposed to cabin pressure altitude of several thousand feet. Small amounts of alcohol and low doses of certain drugs, such as antihistamines, tranquilizers, sedatives and analgesics can, through their depressant actions, render the brain much more susceptible to hypoxia. Extreme heat and cold, fever, and anxiety increase the body's demand for oxygen, and hence its susceptibility to hypoxia.

10.2.1.5 The effects of hypoxia are usually quite difficult to recognize, especially when they occur gradually. Since symptoms of hypoxia do not vary in an individual, the ability to recognize hypoxia can be greatly improved by experiencing and witnessing the effects of hypoxia during an altitude chamber "flight." The FAA provides this opportunity through aviation physiology training, which is conducted at the FAA Civil Aeromedical Institute and at many military facilities across the United States, to attend the Physiological Training Program at the Civil Aeromedical Institute, Mike Monroney Aeronautical Center, Oklahoma City, OK, contact by telephone (405) 680-4837, or by writing Airmen Education Branch, AAM-420, CAMI, Mike Monroney Aeronautical Center, P.O. Box 25082, Oklahoma City, OK 73125.

NOTE.—To attend the Physiological Training Program at one of the military installations having the training capability, an application form and a fee must be submitted. Full particulars about location, fees, scheduling procedures, course content, individual requirements, etc. are contained in the Physiological Training Application, form number AC-3150-7, which is obtained by contacting the Accident Prevention Specialist or the Office Forms Manager in the nearest FAA office.

10.2.1.6 Hypoxia is prevented by heeding factors that reduce tolerance to altitude, by enriching the inspired air with oxygen from an appropriate oxygen system and by maintaining a comfortable, safe cabin pressure altitude. For optimum protection, pilots are encouraged to use supplemental oxygen above 10,000 feet during the day, and above 5,000 feet at night. The Federal Aviation Regulations require that the minimum flight crew be provided with and use supplemental oxygen after 30 minutes of exposure to cabin pressure altitudes between 12,500 and 14,000 feet, and immediately on exposure to cabin pressure altitudes above 14,000. Every occupant of the aircraft must be provided with supplemental oxygen at cabin pressure altitudes above 15,00 feet.

10.2.2 Ear Block

10.2.2.1 As the aircraft cabin pressure decreases during ascent, the expanding air in the middle ear pushes the eustachian tube open and, by escaping down it to the nasal passages, equalizes in pressure with the cabin pressure. But during descent, the pilot must periodically open the eustachian tube to equalize pressure. This can be accomplished by swallowing, yawning, tensing muscles in the throat or, if these do not work, by the combination of closing the mouth, pinching the nose closed and attempting to blow through the nostrils (Valsalva manuever).

10.2.2.2 Either an upper respiratory infection, such as a cold or sore throat, or a nasal allergic condition can produce enough congestion around the eustachian tube to make equalization difficult. Consequently, the difference in pressure between the middle ear and aircraft cabin can build up to a level that will hold the eustachian tube closed, making equalization difficult if not impossible. This problem is commonly referred to as an "ear block."

10.2.2.3 An ear block produces severe ear pain and loss of hearing that can last from several hours to several days. Rupture of the ear drum can occur in flight or after landing. Fluid can accumulate in the middle ear and become infected.

10.2.2.4 An ear block is prevented by not flying with an upper respiratory infection or nasal allergic condition. Adequate protection is usually not provided by decongestant sprays or drops to reduce congestion around the eustachian tubes. Oral decongestants have side effects that can significantly impair pilot performance.

10.2.2.5 If an ear block does not clear shortly after landing, a physician should be consulted.

10.2.3 Sinus Block

10.2.3.1 During ascent and descent, air pressure in the sinuses equalizes with the aircraft cabin pressure through small openings that connect the sinuses to the nasal passages. Either an upper respiratory infection, such as a cold or sinusitis, or a nasal allergic condition can produce enough congestion around an opening to slow equalization and, as the difference in pressure between the sinus and cabin mounts, eventually plug the opening. This "sinus block" occurs most frequently during descent.

10.2.3.2 A sinus block can occur in the frontal sinuses, located above each eyebrow, or in the maxillary sinuses, located in each upper cheek. It will usually produce excruciating pain over the sinus area. A maxillary sinus block can also make the upper teeth ache. Bloody mucus may discharge from the nasal passages.

10.2.3.3 A sinus block is prevented by not flying with an upper respiratory infection or nasal allergic condition. Adequate protection is usually not provided by decongestant sprays or drops to reduce congestion around the sinus openings. Oral decongestants have side effects that can impair pilot performance.

10.2.3.4 If a sinus block does not clear shortly after landing, a physician should be consulted.

10.2.4 Decompression Sickness After Scuba Diving

10.2.4.1 A pilot or passenger who intends to fly after SCUBA diving should allow the body sufficient time to rid itself of excess nitrogen absorbed during diving. If not, decompression sickness due to evolved gas can occur during exposure to low altitude and create a serious inflight emergency.

10.2.4.2 The recommended waiting time before going to flight altitudes of up to 8,000 feet is at least 12 hours after diving which has not required controlled ascent (nondecompression stop diving), and at least 24 hours after diving which has required controlled ascent (decompression stop diving). The waiting time before going to flight altitudes above 8,000 feet should be at least 24 hours after any SCUBA dive. These recommended altitudes are actual flight altitudes above mean sea level (AMSL) and not pressurized cabin altitudes. This takes into consideration the risk of decompression of the aircraft during flight.

10.3 HYPERVENTILATION IN FLIGHT

10.3.1 Hyperventilation, or an abnormal increase in the volume of air breathed in and out of the lungs, can occur subconsciously when a stressed situation is encountered in flight. As hyperventilation "blows off" excessive carbon dioxide from the body, a pilot can experience symptoms of lightheadedness, suffocation, drowsiness, tingling in the extremities, and coolness — and react to them with even greater hyperventilation. Incapacitation can eventually result from incoordination, disorientation, and painful muscle spasms. Finally, unconsciousness can occur.

10.3.2 The symptoms of hyperventilation subside within a few minutes after the rate and depth of breathing are consciously brought back under control. The buildup of carbon dioxide in the body can be hastened by controlled breathing in and out of a paper bag held over the nose and mouth.

10.3.3 Early symptoms of hyperventilation and hypoxia are similar. Moreover, hyperventilation and hypoxia can occur at the same time. Therefore, if a pilot is using an oxygen system when symptoms are experienced, the oxygen regulator should immediately be set to deliver 100 percent oxygen, and then the system checked to assure that it has been functioning effectively before giving attention to rate and depth of breathing.

10.4 CARBON MONOXIDE POISONING IN FLIGHT

10.4.1 Carbon monoxide is a colorless, odorless and tasteless gas contained in exhaust fumes. When breathed even in minute quantities over a period of time, it can significantly reduce the ability of the blood to carry oxygen. Consequently, effects of hypoxia occur (see above).

10.4.2 Most heaters in light aircraft work by air flowing over the manifold. Use of these heaters while exhaust fumes are escaping through manifold cracks and seals is responsible every year for several non-fatal and fatal aircraft accidents from carbon monoxide poisoning.

10.4.3 A pilot who detects the odor of exhaust or experiences symptoms of headache, drowsiness, or dizziness while using the heater should suspect carbon monoxide poisoning, and immediately shut off the heater and open air vents. If symptoms are severe, or continue after landing, medical treatment should be sought.

10.5 ILLUSIONS IN FLIGHT

10.5.1 Introduction

10.5.1.1 Many different illusions can be experienced in flight. Some can lead to spatial disorientation. Others can lead to landing errors. Illusions rank among the most common factors cited as contributing to fatal aircraft accidents.

10.5.2 Illusions Leading to Spatial Disorientation

10.5.2.1 Various complex motions and forces and certain visual scenes encountered in flight can create illusions of motion and position. Spatial disorientation from these illusions can be prevented only by visual reference to reliable, fixed points on the ground or to flight instruments.

10.5.2.1.1 The leans — An abrupt correction of a banked attitude, which has been entered too slowly to stimulate the motion sensing system in the inner ear, can create the illusion of banking in the opposite direction. The disoriented pilot will roll the aircraft back into its original dangerous attitude or, if level flight is maintained, will feel compelled to lean in the perceived vertical plane until this illusion subsides.

10.5.2.1.2 Coriolis illusion — An abrupt head movement in a prolonged constant-rate turn that has ceased stimulating the motion sensing system can create the illusion of rotation or movement in an entirely different axis. The disoriented pilot will maneuver the aircraft into a dangerous attitude in an attempt to stop rotation. This most overwhelming of all illusions in flight may be prevented by not making sudden, extreme head movements, particularly while making prolonged constant-rate turns under IFR conditions.

10.5.2.1.3 Graveyard spin — A proper recovery from a spin that has ceased stimulating the motion sensing system can create the illusion of spinning in the opposite direction. The disoriented pilot will return the aircraft to its original spin.

10.5.2.1.4 Graveyard spiral — An observed loss of altitude during a coordinated constant-rate turn that has ceased stimulating the motion sensing system can create the illusion of being in a descent with the wings level. The disoriented pilot will pull back on the controls, tightening the spiral and increasing the loss of altitude.

10.5.2.1.5 Somatogravic illusion — A rapid acceleration during takeoff can create the illusion of being in a nose-up attitude. The disoriented pilot will push the aircraft into a nose-low, or dive attitude. A rapid deceleration by a quick reduction of the throttles can have the opposite effect, with the disoriented pilot pulling the aircraft into a nose-up, or stall attitude.

10.5.2.1.6 Inversion illusion — An abrupt change from climb to straight and level flight can create the illusion of tumbling backwards. The disoriented pilot will push the aircraft abruptly into a nose-low attitude, possibly intensifying this illusion.

10.5.2.1.7 Elevator illusion — An abrupt upward vertical acceleration, usually by an updraft, can create the illusion of being in a climb. The disoriented pilot will push the aircraft into a nose-low attitude. An abrupt downward vertical acceleration, usually by a downdraft, has the opposite effect, with the disoriented pilot pulling the aircraft into a nose-up attitude.

10.5.2.1.8 False horizon — Sloping cloud formations, an obscured horizon, a dark scene spread with ground lights and stars, and certain geometric patterns of ground lights can create illusions of not being aligned correctly with the actual horizon. The disoriented pilot will place the aircraft in a dangerous attitude.

10.5.2.1.9 Autokinesis — In the dark, a static light will appear to move about when stared at for many seconds. The disoriented pilot will lose control of the aircraft in attempting to align it with the light.

10.5.3 Illusions Leading to Landing Errors

10.5.3.1 Various surface features and atmospheric conditions encountered in landing can create illusions of incorrect height above and distance from the runway threshold. Landing errors from these illusions can be prevented by anticipating them during approaches, aerial visual inspection of unfamiliar airports before landing, using electronic glide slope or VASI systems when available, and maintaining optimum proficiency in landing procedures.

10.5.3.1.1 Runway width illusion — A narrower-than-usual runway can create the illusion that the aircraft is at a higher altitude than it actually is. The pilot who does not recognize this illusion will fly a lower approach, with the risk of striking objects along the approach path or landing short. A wider-than-usual runway can have the opposite effect, with the risk of leveling out high and landing hard or overshooting the runway.

10.5.3.1.2 Runway and terrain slopes illusion — An upsloping runway, upsloping terrain, or both, can create the illusion that the aircraft is at a higher altitude that it actually is. The pilot who does not recognize this illusion will fly a lower approach. A downsloping runway, downsloping approach terrain, or both, can have the opposite effect.

10.5.3.1.3 Featureless terrain illusion — An absence of ground features, as when landing over water, darkened areas and terrain made featureless by snow, can create the illusion that the aircraft is at a higher altitude that it actually is. The pilot who does not recognize this illusion will fly a lower approach.

10.5.3.1.4 Atmospheric illusions — Rain on the windscreen can create the illusion of greater height, and atmospheric haze can create the illusion of being at greater distance from the runway. The pilot who does not recognize these illusions will fly a lower approach. Penetration of fog can create the illusion of pitching up. The pilot who does not recognize this illusion will steepen the approach, often quite abruptly.

10.5.3.1.5 Ground lighting illusions — Lights along a straight path, such as a road, and even lights on moving trains can be mistaken for runway and approach lights. Bright runway and approach lighting systems, especially where few lights illuminate the surrounding terrain, may create the illusion of less distance to the runway. The pilot who does not recognize this illusion will fly a higher approach. Conversely, the pilot overflying ter-

rain which has few lights to provide height cues may make lower than normal approach.

10.6 VISION IN FLIGHT

10.6.1 Introduction

10.6.1.1 Of the body senses, vision is the most important for safe flight. Major factors that determine how effectively vision can be used are the level of illumination and the technique of scanning the sky for other aircraft.

10.6.2 Vision Under Dim and Bright Illumination

10.6.2.1 Under conditions of dim illumination, small print and colors on aeronautical charts and aircraft instruments become unreadable unless adequate cockpit lighting is available. Moreover, another aircraft must be much closer to be seen unless its navigation lights are on.

10.6.2.2 In darkness, vision becomes more sensitive to light, a process called dark adaption. Although exposure to total darkness for at least 30 minutes is required for complete dark adaptation, the pilot can achieve a moderate degree of dark adaption within 20 minutes under dim red cockpit lighting. Since red light severely distorts colors, especially on aeronautical charts, and can cause serious difficulty in focusing the eyes on objects inside the aircraft, its use is advisable only where optimum outside night vision capability is necessary. Even so, white cockpit lighting must be available when needed for map and instrument reading, especially under IFR conditions. Dark adaptation is impaired by exposure to cabin pressure altitude above 5,000 feet, carbon monoxide inhaled in smoking and from exhaust fumes, deficiency of Vitamin A in the diet, and by prolonged exposure to bright sunlight. Since any degree of dark adaptation is lost within a few seconds of viewing a bright light, the pilot should close one eye when using a light to preserve some degree of night vision.

10.6.2.3 Excessive illumination, especially from light reflected off the canopy, surfaces inside the aircraft, clouds, water, snow, and desert terrain, can produce glare, with uncomfortable squinting, watering of the eyes, and even temporary blindness. Sunglasses for protection from glare should absorb at least 85 percent of visible light (15 percent transmittance) and all colors equally (neutral transmittance), with negligible image distortion from refractive and prismatic errors.

10.6.3 Scanning for Other Aircraft

10.6.3.1 Scanning the sky for other aircraft is a key factor in collision avoidance. It should be used continuously by the pilot and copilot (or right seat passenger) to cover all areas of the sky visible from the cockpit. Although pilots must meet specific visual acuity requirements, the ability to read an eye chart does not ensure that one will be able to efficiently spot other aircraft. Pilots must develop an effective scanning technique which maximizes one's visual capabilities. The probability of spotting a potential collision threat obviously increases with the time spent looking outside the cockpit. Thus, one must use timesharing techniques to efficiently scan the surrounding airspace while monitoring instruments as well.

10.6.3.2 While the eyes can observe an approximate 200 degree arc of the horizon at one glance, ony a very small center area called the fovea, in the rear of the eye, has the ability to send clear, sharply focused messages to the brain. All other visual information that is not processed directly theough the fovea will be of less detail. An aircraft at a distance of 7 miles which appears in sharp focus within the foveal center of vision would have to be as close as 7/10 of a mile in order to be recognized if it were outside of foveal vision. Because the eyes can focus only on this narrow viewing area, effective scanning is accomplished with a series of short, regularly spaced eye movements that bring successive areas of the sky into the central visual field. Each movement should not exceed 10 degrees, and each area should be observed for at least one second to enable detection. Although horizontal back-and-forth eye movements seem preferred by most pilots, each pilot should develop a scanning pattern that is most comfortable and then adhere to it to assure optimum scanning.

10.6.3.3 Studies show that the time a pilot spends on visual tasks inside the cabin should represent no more than ¼ to ⅓ of the scan time outside, or no more than 4 to 5 seconds on the instrument panel for every 16 seconds utside. Since the brain is already trained to process sight information that is presented from left to right, one may find it easier to start scanning over the left shoulder and proceed across the windshield to the right.

10.6.3.4 Pilots should realize that their eyes may require several seconds to refocus when switching views between items in the cockpit and distant objects. The eyes will also tire more quickly when forced to adjust to distances immediately after close-up focus, as required for scanning the instrument panel. Eye fatigue can be reduced by looking from the instrument panel to the left wing past the wing tip to the center of the first scan quadrant when beginning the exterior scan. After having scanned from left to right, allow the eyes to return to the cabin along the right wing from its tip inward. Once back inside, one should automatically commence the panel scan.

10.6.3.5 Effective scanning also helps avoid "empty-field myopia." This condition usually occurs when flying above the clouds or in a haze layer that provides nothing specific to focus on outside the aircraft. This causes the eyes to relax and seek a comfortable focal distance which may range from 10 to 30 feet. For the pilot, this means looking without seeing, which is dangerous.

10.7 JUDGEMENT ASPECTS OF COLLISION AVOIDANCE

10.7.1 Introduction

The most important aspects of vision and the techniques to scan for the other aircraft are described in Paragraph 10.6.3 above. Pilots should also be familiar with following information to reduce the possibility of mid-air collisions.

10.7.2 Determinimg Relative Altitude

Use the horizon as a reference point. If the other aircraft is above the horizon, it is probably on a higher flight path. If the aircraft appears to be below the horizon, it is probably flying at a lower altitude.

10.7.3 Taking Appropriate Action

Pilots should be familiar with rules on right-of-way, so if an aircraft is on an obvious collision course, one can take immediately evasive action, preferrable in compliance with applicable Federal Aviation Regulations.

10.7.4 Consider Multiple Threats

The decision to climb, descend, or turn is a matter of personal judgement, but one should anticipate that the other pilot may also be making a quick maneuver. Watch the other aircraft during the maneuver and begin your scanning again immediately since there may be other aircraft in the area.

10.7.5 Collision Course Targets

Any aircraft that appears to have no relative motion and stays in one scan quadrant is likely to be on a collision course. Also, if a target shows no lateral or vertical motion, but increases in size,*TAKE EVASIVE ACTION.*

10.7.6 Recognize High Hazard Areas

Airways and especially VORs and airport traffic areas are places where aircraft tend to cluster.

Remember, most collisions occur during days when the weather is good. Being in a "radar environment" still requires vigilance to avoid collisions.

10.7.7 Cockpit Management

Studying maps, checklists, and manuals before flight, with various other proper preflight planning (e.g., noting necessary radio frequecies) and organizing cockpit materials, can reduce the amount of time required to look at these items during flight permitting more scan time.

10.7.8 Windshield Conditions

Dirty or bug-smeared windshields can greatly reduce the ability of pilots to see other aircraft. Keep a clean windshield.

10.7.9 Visibility Conditions

Smoke, haze, dust, rain, and flying towards the sun can also greatly reduce the ability to detect targets.

10.7.10 Visual Obstruction in the Cockpit

Pilots need to move their heads to see around blind spots caused by fixed aircraft structures, such as door posts, wings, etc. It will be necessary at times to maneuver the aircraft (e.g., lift a wing) to facilitate seeing around this structure.

Pilots must insure that curtains and other cockpit objects (e.g., maps on glare shield) are removed and stowed during flight.

10.7.11 Lights On

Day or night, use of exterior lights can greatly increase the conspicuity of any aircraft.

Keep interior lights low at night.

10.7.12 ATC Support

ATC facilities often provide radar traffic advisories on a workload-permitting basis. Flight through the new Airport Radar Service Areas (ARSA's) requires communication with ATC. Use this support whenever possible or when required.

1 CITY, STATE/AERODROME: **BALTIMORE, MD/BALTIMORE WASHINGTON INTERNATIONAL**

2 REFERENCE POINT:
Lat. 39°10'31.5''N, Long. 76°40'05.5''W.

3 DISTANCE AND DIRECTION FROM CITY:
9 NM S.

4 ELEVATION:
146 FT (48 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
30.4°C. (July).

6 MAGNETIC VARIATION:
10°W.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
State of Maryland

10 POSTAL ADDRESS:
Baltimore-Washington International Airport
P.O. Box 8766
Baltimore, MD 21240

11 TELEGRAPHIC ADDRESSES:
AFTN: KBWI

12 TELEPHONE NUMBERS:
301-859-7100/7022

13 OVERNIGHT ACCOMMODATION:
Unlimited.

14 RESTAURANT ACCOMMODATION:
Unlimited.

15 MEDICAL FACILITIES:
First-aid room at airport.
Hospitals in city.

16 TRANSPORTATION AVAILABLE:
Busses, taxis, and limousines.

17 CARGO HANDLING FACILITIES:
Adequate for all anticipated requirements.

18 FUEL GRADES:
A, 100LL.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High and low pressure and replacement bottles.

21 REFUELING FACILITIES AND LIMITATIONS:
No.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
Yes—up to DC-8.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index D.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
RWY 04/22 CLSD MULTI-ENG ACFT 2200-0700. RWY 04/22 CLSD jet ACFT TKOF. RWY 22 CLSD LDG jet ACFT. RWY 04/22 restrictions apply EXC when excessive crosswinds or EMERG preclude use of other RWYS. RWY 15L/33R CLSD EXC propeller ACFT 30,000 LB (14 000 KG) or less. Practice LDG & APCH by turbo-PWRD ACFT prohibited 2200-0600; practice LDG & TKOF by B-747 ACFT prohibited on RWY 15R/33L. LDG fee. Birds OCNL on and in VCY of the AP. Noise abatement PROC in effect. RWY 15L/33R CLSD major CONST. Major CONST on AP daily.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	6	7	12	17	23	28	30	29	26	20	13	7
Min (B)	-4	-3	1	5	11	17	19	18	14	8	2	-3

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)
(B)

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)
(B)

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **BALTIMORE, MD/BALTIMORE WASHINGTON INTERNATIONAL**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
04 22	33°12' 213°12'	1830 x 45	1830 1830	2135 2135	1830 1830	1830 1830	146 138	- -	305 305	46/F/A/X/T	ASPH-Grooved	- -
10 28	94°12' 274°12'	2881 x 60	2881 2881	3186 3186	2881 2881	2881 2881	141 128	- -	305 305	50/F/A/N/T	ASPH-Grooved	- -
15L 33R	144°14' 324°14'	1524 x 30	1524 1524	1524 1524	1524 1524	1524 1524	142 115	- -	- -	-	ASPH-Grooved	- -
15R 33L	144°12' 324°12'	2902 x 45	2902 2902	3207 3207	2902 2902	2902 2902	140 130	- -	305 305	50/F/A/X/T	ASPH-Grooved	- -

Landing Area Remarks: 1150 FT x 150 FT (46 X 46) ASPH blast pads lctd on both ends of RWY 10/28 and RWY 15R/33L.

31 MOVEMENT AREAS

APRONS: 75 FT (23) width. ASPH. TAXIWAYS: 75 FT (23) width. ASPH. HELICOPTER ALIGHTING AREA: Yes—General Aviation Ramp.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM: LGTD signs at all INTS. B TWY LGTS all TWYS.

33 VISUAL AIDS TO LOCATION: Rotating BCN—ALTN W and G.

34 INDICATORS AND GROUND SIGNALLING DEVICES: Wind indicator—lgtd.

35 LIGHTING AIDS

APPROACH LIGHTS: RWY 10—ALSF2. RWY 15R—SSALR. RWYS 33L, 28—MALSR
RVR: RWYS 10, 28.
RVV: RWY 10.
REIL: RWYS 04, 22, 33R, 15L.
VASI: RWYS 22, 28, 33L, 33R, 04, 15L.
THRESHOLD LIGHTS: All THR—G.
RUNWAY LIGHTS: RWYS 04/22, 10/28, 15R/33L, 15L/33R—W high INTST. RWY 10, 33L—TDZ. RWY 10/28, 15R—CL. Helipad UNLIGHTED.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY: Yes

37 OBSTRUCTION MARKING AND LIGHTING:

38 MARKING AIDS: RWY CL and sidestripes, numerals, THR, and touchdown markings. TWY CL and TWY hold markings. RWY fixed-distance markers.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	10	28	15R	33L	04	22	15L	33R
Controlling Obstruction	Tree		Twr		Tree	Pole	Trees	Gnd
Obstn Clnc Slope	44:1	50:1	31:1	50:1	29:1	29:1	14:1	10:1
Dist from Runway End	2,260 (689)		43,420 (13 235)		1,920 (585)	1,820 (555)	1,240 (378)	340 (104)

Obstruction Remarks: UnLGTD crane 117 FT AGL, 1,500 FT (457) right and 2,100 FT (640) south APCH end RWY 04.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY: Yes, B-747.

1 CITY, STATE/AERODROME: **EVERETT, WA/SNOHOMISH COUNTY (PAINE FIELD)** [ALTERNATE]

2 REFERENCE POINT:
Lat. 47°54'27.5''N, Long. 122°16'54''W.

3 DISTANCE AND DIRECTION FROM CITY:
6 NM SW.

4 ELEVATION:
606 FT (185 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
17°C. (July).

6 MAGNETIC VARIATION:
21°E.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
May-Oct 0500-2100; Nov-Apr 0500-1900.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
Snohomish County.

10 POSTAL ADDRESS:
Airport Manager
3220 100th Street, SW
Everett, Washington 98204

11 TELEGRAPHIC ADDRESSES:
AFTN: KPAE

12 TELEPHONE NUMBERS:
206-353-2110

13 OVERNIGHT ACCOMMODATION:
Yes.

14 RESTAURANT ACCOMMODATION:
Yes.

15 MEDICAL FACILITIES:
Yes.

16 TRANSPORTATION AVAILABLE:
Yes.

17 CARGO HANDLING FACILITIES:
None.

18 FUEL GRADES:
80, 100, Jet A.

19 OIL GRADES:
Limited piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High pressure oxygen.

21 REFUELING FACILITIES AND LIMITATIONS:
Fuel after hours 206-355-6600.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
No.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index A, U.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Arpt clsd ACR opns 2100-0700 excp with PPR. Fee for acft over 30,000 LB (13 605). When ATCT clsd, Rwy 34L left tfc for acft 12,500 lbs GWT, and Military helicopter opns unable to communicate on VHF. Noise sensitive arpt. Acft ovr 250 HP should request Rwy 16R/34L.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	6	8	9	13	16	19	22	21	19	14	9	7
Min (B)	0	2	2	4	7	9	11	12	10	7	4	2

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)												
(B)												

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)	78	76	68	64	64	67	62	65	66	73	77	82
(B)	87	88	86	85	84	85	84	88	90	90	88	89

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **EVERETT, WA/SNOHOMISH COUNTY (PAINE FIELD) [ALTERNATE]**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
11	134°08'	1376 x 23	1376	1376	1376	1132	572	-	-	33/F/B/X/T	ASPH	-
29	314°08'		1376	1376	1376	1376	600	-	-			-
16L	179°34'	914 x 23	914	914	914	914	597	-	-	-	ASPH-Grooved	-
34R	359°34'		914	914	914	914	596	-	-			-
16R	179°08'	2746 x 45	2746	2746	2746	2746	554	-	-	71/F/B/X/T	ASPH-CONC	-
34L	359°08'		2746	2746	2746	2746	573	-	-			-

Landing Area Remarks: Rwys 11/29, 16L/34R clsd when ATCT clsd and, clsd to acft over 250 horsepower unless directed by ATC. Rwy 11 thr dsplcd 799 FT (244).

31 MOVEMENT AREAS

APRONS: ASPH. TAXIWAYS: ASPH. HELICOPTER ALIGHTING AREA: Yes.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM: B TWY LGTS.

33 VISUAL AIDS TO LOCATION: Rotating BCN—ALTN W and G.

34 INDICATORS AND GROUND SIGNALLING DEVICES: None.

35 LIGHTING AIDS

APPROACH LIGHTS: RWY 16R—MALSR, RWY 34L—ODALS, activate on 121.3 when TWR CLSD.
RVR: 16R.
VASI: RWYS 34L, 11, 29.
REIL: RWYS 16L, 34R.
THRESHOLD LIGHTS: None.
RUNWAY LIGHTS: RWYS 11/29, 16L/34R—medium INTST. RWY 16R/34L—high INTST.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY: No.

37 OBSTRUCTION MARKING AND LIGHTING:

38 MARKING AIDS: RWY CL and sidestripes, numerals, THR, touchdown, and TWY hold markings. Rwy 34L side stripes at 150 feet, full 200 feet usable, rwy lgts at 200 feet.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	11	29	16R	34L	16L	34R
Controlling Obstruction	Trees	Trees		Trees		Pole
Obstn Clnc Slope	0:1	23:1	50:1	30:1	22:1	19:1
Dist from Runway End	200 (61)	1,300 (396)		4,000 (1219)		690 (210)

Obstruction Remarks: APCH ratio to displaced THR RWY 11—28:1.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY: Yes, B-707

1 CITY, STATE/AERODROME: **INDIANAPOLIS, IN/INDIANAPOLIS INTERNATIONAL** [ALTERNATE]

2 REFERENCE POINT:
Lat. 39°43'11.8''N, Long. 86°17'12.5''W.

3 DISTANCE AND DIRECTION FROM CITY:
7 NM SW.

4 ELEVATION:
798 FT (243 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
31°C. (July).

6 MAGNETIC VARIATION:
2°W.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
Indianapolis Airport Authority

10 POSTAL ADDRESS:
Indianapolis International Airport
2500 S. High School Rd
Indianapolis, IN 46241

11 TELEGRAPHIC ADDRESSES:
AFTN: KIND

12 TELEPHONE NUMBERS:
317-487-9594

13 OVERNIGHT ACCOMMODATION:
Unlimited.

14 RESTAURANT ACCOMMODATION:
Unlimited.

15 MEDICAL FACILITIES:
First-aid room at airport.
Ambulance on call.
Hospitals in city.

16 TRANSPORTATION AVAILABLE:
Busses, taxis, limousines and rental cars.

17 CARGO HANDLING FACILITIES:
Available by prior arrangement.

18 FUEL GRADES:
Jet A, A1, 100LL.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High pressure oxygen and high pressure replacement bottles.

21 REFUELING FACILITIES AND LIMITATIONS:
None.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
Yes—up to DC-3.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index C.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Primary student TGL not permitted. Flocks of birds on and in VCY of the AP SS and SR. Noise abatement proc in effect - 317-248-9594.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
Yes.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	3	4	10	17	23	28	31	30	26	20	10	4
Min (B)	-6	-5	-1	4	10	16	18	17	13	7	0	-5

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)
(B)

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)
(B)

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **INDIANAPOLIS, IN/INDIANAPOLIS INTERNATIONAL [ALTERNATE]**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
05L 23R	44°33' 224°33'	3050 x 45	3050 3050	3050 3050	3110 3110	3050 3050	765 798	60 60	- -	56/R/C/X/T	ASPH-Grooved	ASPH ASPH
05R 23L	44°33' 224°33'	3048 x 45	3048 3048	3048 3048	3108 3108	3048 3048	789 788	60 60	- -	62/R/D/W/T	CONC-Grooved	ASPH ASPH
14 32	134°33' 314°33'	2318 x 45	2318 2318	2318 2318	2378 2378	2318 2318	788 781	60 60	- -	56/R/C/X/T	ASPH-Grooved	ASPH ASPH

Landing Area Remarks: High speed exits RWYS 05L, 23R, 14, 32.

31 MOVEMENT AREAS

APRONS: ASPH. TAXIWAYS: 75 FT (23) and 104 FT (32) widths. CONC EXC for 30 FT (09) ASPH TWY for RWY 04R/22L. HELICOPTER ALIGHTING AREA: Yes—as directed by TWR.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM: LGTD signs at main INTS. B TWY LGTS all TWYS.

33 VISUAL AIDS TO LOCATION: Rotating BCN—ALTN W and G.

34 INDICATORS AND GROUND SIGNALLING DEVICES: Wind indicator—LGTD.

35 LIGHTING AIDS

APPROACH LIGHTS: RWY 05L, 05R—ALSF2. RWY 23R—MALSR. RWY 14, 23L, 32—MALSR.
VASI: RWY 05R.
RVR: RWYS 05L, 32, 23R, 05R.
RVV: RWY 32.
THRESHOLD LIGHTS: All THRS—G.
RUNWAY LIGHTS: RWYS 05L/23R, 14/32, 05R/23L—W high INTST. TDZ—RWY 05L and 05R. CL LGTS—RWY 05L/23R and 05R/23L.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY: EMERG generator.

37 OBSTRUCTION MARKING AND LIGHTING: R obstruction LGTS—day and NGT.

38 MARKING AIDS: RWY CL, sidestripes, numerals, THRS, touchdown, and fixed distance markings. TWY CL and TWY hold markings.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	14	32	05L	23R	05R	23L
Controlling Obstruction	RR					Ant
Obstn Clnc Slope	40:1	50:1	50:1	50:1	50:1	47:1
Dist from Runway End	1,171 (357)					4,150 (1265)

Obstruction Remarks: None.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY: Yes, B-707

1 CITY, STATE/AERODROME: **LOS ANGELES, CA/LOS ANGELES INTERNATIONAL**

2 REFERENCE POINT:
Lat. 33°56'33.2''N., Long. 118°24'29.1''W.

3 DISTANCE AND DIRECTION FROM CITY:
9 NM SW.

4 ELEVATION:
126 FT (38 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
24°C. (August).

6 MAGNETIC VARIATION:
14°E.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
City of Los Angeles

10 POSTAL ADDRESS:
Los Angeles International Airport
No. 1 World Way
Los Angeles, CA 90045

11 TELEGRAPHIC ADDRESSES:
AFTN: KLAX

12 TELEPHONE NUMBERS:
310-646-4267

13 OVERNIGHT ACCOMMODATION:
Unlimited.

14 RESTAURANT ACCOMMODATION:
Unlimited.

15 MEDICAL FACILITIES:
First-aid at airport.
Hospitals in city.

16 TRANSPORTATION AVAILABLE:
Busses, taxis, limousines, rental cars, and helicopters.

17 CARGO HANDLING FACILITIES:
Adequate for all anticipated requirements.

18 FUEL GRADES:
100, 100LL, Jet A..

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High pressure replacement bottles.

21 REFUELING FACILITIES AND LIMITATIONS:
No.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
No.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index E.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Numerous birds on and in the VCY of the AP. RITE TFC RWYS 24R, 24L, 07L, 07R. Noise sensitive AP on westerly TKOFS, no turns BFR XNG shoreline. Over ocean APCH used 2400-0630. Practice instrument APCHS and TGL are prohibited. Overnight storage fee.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	17	17	18	19	21	22	24	24	24	22	21	19
Min (B)	6	7	9	11	13	14	16	16	15	13	9	7

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)
(B)

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)
(B)

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **LOS ANGELES, CA/LOS ANGELES INTERNATIONAL**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
06L 24R	82°59' 262°59'	2721 x 45	2721 2721	2721 2721	2721 2721	2721 2721	112 117	- -	- -	61/R/A/W/T	CONC- Grooved	- -
06R 24L	82°59' 262°59'	3135 x 45	3135 3135	3135 3348	3135 3135	3037 3135	108 111	- -	- 213	58/R/A/W/U	CONC- Grooved	- -
07L 25R	83°00' 263°00'	3686 x 45	3686 3686	3686 3686	3686 3686	3686 3394	119 94	- -	- -	70/R/B/W/T	CONC- Grooved	- -
07R 25L	83°00' 263°00'	3382 x 60	3382 3382	3382 3382	3382 3382	3382 3382	119 94	- -	- -	51/R/A/X/U	CONC- Grooved	- -

Landing Area Remarks: RWY 25R—THR displaced 958 FT (292); RWY 06R—THR displaced 321 FT (98). High speed exits RWYS 06L, 06R, 07L, 07R, 24L, 24R, 25L, 25R. CAUTION: Turbulence may be deflected upward from the blast fence 180 FT (55) east of RWY 25R.

31 MOVEMENT AREAS

APRONS: Bitumen and CONC. TAXIWAYS: 75 FT (23) width. ASPH and CONC. HELICOPTER ALIGHTING AREA: Yes—2,700 FT (488) W of the TWR.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM: LGTD signs at major INTS. B TWY LGTS or G CL.

33 VISUAL AIDS TO LOCATION: Rotating BCN—ALTN W and G.

34 INDICATORS AND GROUND SIGNALLING DEVICES: Wind socks—LGTD.

35 LIGHTING AIDS

APPROACH LIGHTS: RWYS 25L, 24R—ALSF2. RWYS 06L, 24L, 06R, 07L, 07R—MALSR.
VASI: RWYS 07R, 06L, 06R, 07L.
RVR: RWYS 25L, 25R, 07L, 07R, 24L, 24R, 06R, 06L.
THRESHOLD LIGHTS: All THRS—G.
RUNWAY LIGHTS: All—W high INTST. CL—RWYS 06L/24R, 07L/25R, 07R/25L, 06R/24L. TDZ—RWYS 24R, 25L, 06R.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY: Yes.

37 OBSTRUCTION MARKING AND LIGHTING: R obstruction LGTS—day and NGT.

38 MARKING AIDS: RWY CL and sidestripes, numerals, THR and touchdown markings. TWY CL and TWY hold markings. RWYS 07L/25R hold lines have been relocated N on TWYS 28J, 30J, 32J, 36J, and 42J.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	07R	25L	07L	25R	06R	24L	06L	24R
Controlling Obstruction	Pole			RR	Pole		Pole	Sign
Obstn Clnc Slope	32:1	50:1	50:1	5:1	12:1	50:1	45:1	35:1
Dist from Runway End	2,400 (732)			325 (99)	300 (91)		3,000 (914)	1,700 (518)

Obstruction Remarks: Apch ratio to displaced thr: RWY 06R, 50:1; RWY 25R, 50:1.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY: Yes, B-747

1 CITY, STATE/AERODROME: **McALLEN, TX/MILLER INTERNATIONAL**

2 REFERENCE POINT:
Lat. 26°10'32.7''N, Long. 98°14'18.8''W.

3 DISTANCE AND DIRECTION FROM CITY:
2 NM S.

4 ELEVATION:
107 FT (33 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
36°C. (August).

6 MAGNETIC VARIATION:
07°E.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
0600-0000.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
City of McAllen.

10 POSTAL ADDRESS:
City of McAllen
Miller International Airport
P.O. Box 220
McAllen, TX 78502

11 TELEGRAPHIC ADDRESSES:
AFTN: KMFE

12 TELEPHONE NUMBERS:
512-682-9101/1888/1890

13 OVERNIGHT ACCOMMODATION:
Yes.

14 RESTAURANT ACCOMMODATION:
Yes.

15 MEDICAL FACILITIES:
Yes.

16 TRANSPORTATION AVAILABLE:
Yes.

17 CARGO HANDLING FACILITIES:
Limited.

18 FUEL GRADES:
100LL, Jet A.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High pressure oxygen replacement bottles.

21 REFUELING FACILITIES AND LIMITATIONS:
None.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
Yes.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index C.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
None.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	22	24	27	30	33	34	36	36	34	31	26	23
Min (B)	10	12	14	18	21	23	23	23	22	18	18	10

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)
(B)

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)	74	72	70	71	71	69	65	66	70	71	73	75
(B)	89	90	88	90	91	91	92	92	92	90	88	89

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **McALLEN, TX/MILLER INTERNATIONAL**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
13	140°34'	2167 x 45	2167	2167	2167	2118	107	-	-	57/F/C/X/U	ASPH-Grooved	-
31	320°34'		2167	2167	2167	2167	102	-	-			-
18	-	910 x 18	910	910	910	910	-	-	-	07/F/C/Z/U	ASPH	-
36	-		910	910	910	807	-	-	-			-

Landing Area Remarks: RWY 13 THR displaced 160 FT (49). RWY 18/36 CLSD to ACFT over 12,500 LB (5 670) MAX GROSS LDG WT. RWY 36 DISPLACED THR 338 FT (103); displacement not LGTD prior to THR.

31 MOVEMENT AREAS

APRONS: ASPH. TAXIWAYS: 40 FT (12) width—ASPH. HELICOPTER ALIGHTING AREA: None.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM: B TWY LGTS.

33 VISUAL AIDS TO LOCATION: Rotating BCN—ALTN W and G.

34 INDICATORS AND GROUND SIGNALLING DEVICES: Wind indicator LGTD; segmented circle.

35 LIGHTING AIDS

APPROACH LIGHTS: RWY 13—MALSR. When TWR CLSD, key 118.5, 7 times for high INTST, 5 for medium, 3 for low.
RVR: None.
REIL: RWY 31.
VASI: RWYS 31, 18, 36.
THRESHOLD LIGHTS: RWY 13/31—G.
RUNWAY LIGHTS: RWYS 13/31, 18/36—medium INTST. (RWY 18/36 MIRL does not operate when TWR CLSD; RWY 13/31 operates on 30 percent when TWR CLSD.)

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY: No.

37 OBSTRUCTION MARKING AND LIGHTING:

38 MARKING AIDS: CL, sidestripe, THR and numerals.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	13	31	18	36
Controlling Obstruction	Road	Road	Bldg	
Obstn Clnc Slope	32:1	29:1	20:1	50:1
Dist from Runway End	650 (198)	375 (114)	909 (277)	

Obstruction Remarks: RWY 13 APCH ratio to displaced THR 37:1. 100 FT and 180 FT Cranes 800 FT N Rwy 13/31 CNTRLN SR-SS.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY: Yes, DC-9

1 CITY, STATE/AERODROME: **PITTSBURGH, PA/GREATER PITTSBURGH INTERNATIONAL**

2 REFERENCE POINT:
Lat. 40°29'29.5''N, Long. 80°13'56.7''W.

3 DISTANCE AND DIRECTION FROM CITY:
12 NM NW.

4 ELEVATION:
1,203 FT (367 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
28°C. (July).

6 MAGNETIC VARIATION:
6°W.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
County of Allegheny

10 POSTAL ADDRESS:
Court House
Pittsburgh, PA 15219

11 TELEGRAPHIC ADDRESSES:
AFTN: KPIT

12 TELEPHONE NUMBERS:
412-778-2500

13 OVERNIGHT ACCOMMODATION:
Unlimited.

14 RESTAURANT ACCOMMODATION:
Unlimited.

15 MEDICAL FACILITIES:
First-aid room at airport.
Physicians and hospitals in adjacent area and city.

16 TRANSPORTATION AVAILABLE:
Busses, taxis, and limousines.

17 CARGO HANDLING FACILITIES:
Available by prior arrangement.

18 FUEL GRADES:
100LL, Jet A.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
None.

21 REFUELING FACILITIES AND LIMITATIONS:
No.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
No.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
None.

24 CRASH EQUIPMENT:
ARFF Index D.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Deer OCNLY on RWYS. LDG fee.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
Yes.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	3	4	9	15	22	26	28	27	24	17	10	3
Min (B)	-6	-6	-2	3	9	15	17	15	13	6	1	-4

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)
(B)

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)	67	66	58	50	50	54	56	55	56	54	57	68
(B)	84	78	77	74	75	82	85	87	86	83	87	78

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **PITTSBURGH, PA/GREATER PITTSBURGH INTERNATIONAL**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
10L 28R	91°56' 271°56'	3201 x 45	3201 3201	3201 3201	3201 3201	3201 3201	1203 1175	- -	- -	-	ASPH-CONC-Grooved	- -
10C 28C	91°57' 271°57'	2451 x 45	2451 2451	2451 2451	2451 2451	2451 2451	1139 1137	- -	- -	-	ASPH-CONC-Grooved	- -
10R 28L	91°57' 271°57'	3506 x 60	3506 3506	3506 3506	3506 3506	3506 3506	1135 1123	- -	- -	-	CONC-Grooved	- -
14 32	136°23' 316°23'	2469 x 45	2469 2469	2469 2469	2469 2469	2469 2469	1148 1114	- -	- -	-	ASPH-CONC-Grooved	- -

Landing Area Remarks: High speed exits RWYS 10L, 28L, and 10R. All jets DEP RWY 28R must be aligned with RWY prior to applying TKOF PWR.

31 MOVEMENT AREAS

APRONS: CONC. TAXIWAYS: 75 FT (23) width. CONC. HELICOPTER ALIGHTING AREA: Yes—on RWY as directed by TWR.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM: LGTD signs at main INTS. B TWY LGTS all TWYS.

33 VISUAL AIDS TO LOCATION: Rotating BCN—ALTN W and G.

34 INDICATORS AND GROUND SIGNALLING DEVICES: Wind indicator, segmented circle.

35 LIGHTING AIDS

APPROACH LIGHTS: RWYS 10L—ALSF2. RWYS 28R, 28L, 10R—MALSR. RWY 32—MALS.
VASI: RWYS 10R, 28C, 28R, 28L, 14, 32, 10C.
RVR: RWYS 10L, 28R, 28L, 10C.
RVV: RWYS 10L, 28R, 28L.
THRESHOLD LIGHTS: All THRS—G.
RUNWAY LIGHTS: All RWYS—W high INTST. CL LGT—RWYS 10R/28L, 28R, 10C/28C. TDZ—RWYS 10R, 10L, 28R, 28C, 28L.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY: No.

37 OBSTRUCTION MARKING AND LIGHTING: R obstruction LGTS—day and NGT.

38 MARKING AIDS: RWY CL and sidestripes, numerals, THR, and touchdown markings. Runway fixed-distance markers: RWYS 10L/28R, 10R/28L.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	10L	28R	10C	28C	14	32	10R	28L
Controlling Obstruction		Twr	Trees					Tree
Obstn Clnc Slope	50:1	40:1	50:1	35:1	50:1	50:1	50:1	41:1
Dist from Runway End		4,324 (1 318)		3,041 (927)				4,948 (1 508)

Obstruction Remarks: None.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY: Yes, L-1011

1 CITY, STATE/AERODROME: **PUEBLO, CO/PUEBLO MEMORIAL** [ALTERNATE]

2 REFERENCE POINT:
Lat. 38°17'20.7"N, Long. 104°29'47.7"W.

3 DISTANCE AND DIRECTION FROM CITY:
5 NM E.

4 ELEVATION:
4,726 ft. (1 440 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
33°C. (July).

6 MAGNETIC VARIATION:
11°E.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
0600-2300.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
City of Pueblo

10 POSTAL ADDRESS:
31201 Bryan Circle
Pueblo, CO 81001

11 TELEGRAPHIC ADDRESSES:
AFTN: KPUB

12 TELEPHONE NUMBERS:
719-948-3361

13 OVERNIGHT ACCOMMODATION:
Yes.

14 RESTAURANT ACCOMMODATION:
Yes.

15 MEDICAL FACILITIES:
Yes.

16 TRANSPORTATION AVAILABLE:
Yes.

17 CARGO HANDLING FACILITIES:
Limited.

18 FUEL GRADES:
A, 100LL, J4.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High and low pressure oxygen and high pressure replacement bottles.

21 REFUELING FACILITIES AND LIMITATIONS:
Fuel after hrs - call 719-948-2447/4560.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
2 hangars, 20 T-hangars.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index B.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Right tfc Rwy 08R.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	7	10	13	19	24	30	33	32	28	22	14	9
Min (B)	-10	-7	-4	3	8	13	16	16	10	3	-4	-8
Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures												
(A)	1018	1015	1013	1009	1009	1008	1011	1012	1012	1015	1017	1018
(B)	1019	1017	1015	1012	1013	1012	1014	1014	1015	1017	1019	1019
Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures												
(A)	45	34	31	28	29	27	34	33	33	33	44	46
(B)	65	63	63	64	65	67	72	72	70	66	72	67

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **PUEBLO, CO/PUEBLO MEMORIAL [ALTERNATE]**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
08L 26R	88°16' 268°16'	3200 x 45	3200 3200	3200 3200	3200 3200	3200 3200	4667 4646	- -	- -	26/F/C/X/T	ASPH	- -
08R 26L	88°18' 268°18'	1241 x 23	1241 1241	1241 1241	1241 1241	1241 1241	4654 4641	- -	- -	09/R/C/X/T	ASPH	- -
17 35	178°19' 358°19'	2532 x 45	2532 2532	2532 2532	2532 2532	2532 2532	4726 4645	- -	- -	37/F/C/X/T	ASPH	- -

Landing Area Remarks: Rwy 08R twy both ends violates imaginary sfc fr 0-3 ft. extd outward fr 0 to beyond 200 ft. Rwy 08R/26L avbl for lgt single and ltg twin acft daylight hr, and when not in use, as twy for large acft.

31 MOVEMENT AREAS

APRONS: Asphalt.
TAXIWAYS: Asphalt.
HELICOPTER ALIGHTING AREA: None.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM:
Blue taxiing lights.

33 VISUAL AIDS TO LOCATION:
Rotating beacon—alternating white and green.

34 INDICATORS AND GROUND SIGNALLING DEVICES:
Wind indicator, segmented circle.

35 LIGHTING AIDS

APPROACH LIGHTS: Rwy 08L—SSALR
RVR: None.
RVV: Rwy 08L.
REIL: Rwys 26R, 17. When twr clsd, activate REIL on 119.1
VASI: Rwys 26R, 35. When twr clsd, activate VASI on 119.1.
THRESHOLD LIGHTS: None.
RUNWAY LIGHTS: Rwy 08L/26R—high intensity; Rwy 17/35—medium intensity; Rwy 08R/26L—unlighted. When twr clsd, activate Rwy 08L/26R HIRL, Rwy 08L ALS, and Rwy 17/35 MIRL on 119.1.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY:
No.

37 OBSTRUCTION MARKING AND LIGHTING:
Red obstruction lights—day and night.

38 MARKING AIDS:
Runway centerline, sidestripes, numerals, threshold, and touchdown markings.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	08L	26R	08R	26L	17	35
Controlling Obstruction			Gnd	Gnd		
Obstn Clnc Slope	50:1	50:1	43:1	8:1	50:1	50:1
Dist from Runway End			1,060 (323)	257 (78		

Obstruction Remarks: None.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY:
Yes, DC-8-63

1 CITY, STATE/AERODROME: **SYRACUSE, NY/SYRACUSE-HANCOCK INTERNATIONAL** [ALTERNATE]

2 REFERENCE POINT:
Lat. 43°06'40.2"N, Long. 76°06'22.7"W.

3 DISTANCE AND DIRECTION FROM CITY:
4NM NE.

4 ELEVATION:
421 FT (128 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
28°C (July).

6 MAGNETIC VARIATION:
12°W.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
City of Syracuse.

10 POSTAL ADDRESS:
City Hall
Syracuse, NY 13212

11 TELEGRAPHIC ADDRESSES:
AFTN: KSYR

12 TELEPHONE NUMBERS:
315-448-2489

13 OVERNIGHT ACCOMMODATION:
Yes.

14 RESTAURANT ACCOMMODATION:
Yes.

15 MEDICAL FACILITIES:
Yes.

16 TRANSPORTATION AVAILABLE:
Yes.

17 CARGO HANDLING FACILITIES:
Limited.

18 FUEL GRADES:
100LL, Jet A.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High and low pressure oxygen and replacement bottles.

21 REFUELING FACILITIES AND LIMITATIONS:
No.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
Limited.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major aircraft and engine repairs.

24 CRASH EQUIPMENT:
ARFF Index C.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
No charter OPS THRU PAX BLDG WO prior permission. Wildlife on and in the VCY of AP.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	0	0	5	13	20	25	28	27	22	16	8	1
Min (B)	-9	-9	-4	3	9	14	17	16	11	6	1	-6

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)												
(B)												

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)	69	69	63	55	53	53	52	54	56	56	65	70
(B)	77	78	77	74	73	75	76	81	82	82	78	77

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **SYRACUSE, NY/SYRACUSE-HANCOCK INTERNATIONAL** [ALTERNATE]

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
10	87°25'	2744 x 45	2744	2744	2744	2744	419	-	-	43/F/B/X/T	ASPH-Grooved	-
28	267°25'		2744	2744	2744	2744	400	-	-			-
14	133°50'	2286 x 45	2286	2286	2286	2286	416	-	-	43/F/B/X/T	ASPH-Grooved	-
32	313°50'		2286	2286	2286	2286	402	-	-			-

Landing Area Remarks: None.

31 MOVEMENT AREAS

APRONS: ASPH. TAXIWAYS: ASPH. HELICOPTER ALIGHTING AREA: No.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM: B TWY LGTS.

33 VISUAL AIDS TO LOCATION: Rotating BCN—ALTN W and G.

34 INDICATORS AND GROUND SIGNALLING DEVICES: LGTD wind indicator, segmented circle.

35 LIGHTING AIDS

APPROACH LIGHTS: RWY 10—MALSR. RWY 14—MALS. RWY 28—ALSF2.
RVR: RWYS 10, 28.
REIL: None.
VASI: RWYS 10, 14.
THRESHOLD LIGHTS:
RUNWAY LIGHTS: RWYS 10/28 and 14/32—high INTST. CL—RWY 10/28, 14/32. TDZ—RWY 28.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY: None.

37 OBSTRUCTION MARKING AND LIGHTING: R obstruction LGTS—day and NGT.

38 MARKING AIDS: RWY CL and sidestripes, numerals, THRS, touchdown, TWY CL, and taxihold marking. RWY 10/28 distance to go markers on S side of RWY; RWY 14/32, E side of RWY.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	10	28	14	32
Controlling Obstruction	Trees	Trees	Trees	Tree
Obstn Clnc Slope	25:1	36:1	22:1	13:1
Dist from Runway End	2,380 (725)	2,660 (881)	1,240 (378)	660 (201)

Obstruction Remarks:

41 DISABLED AIRCRAFT REMOVAL CAPABILITY: Yes, B-707/C-141

quest the pilot "(Identification), change to my frequency 123.4." This phrase should alert the pilot that he is only changing frequencies, not controller/specialist, and that initial call up phraseology may be abbreviated.

EXAMPLE:

"United 222 on 123.4."

7.7.5 Compliance with Frequency Changes. When instructed by ATC to change frequencies, select the new frequency as soon as possible unless instructed to make the change at a specific time, fix, or altitude. A delay in making the change could result in an untimely receipt of important information. If you are instructed to make the frequency change at a specific time, fix, or altitude, monitor the frequency you are on until reaching the specified time, fix, or altitudes unless instructed otherwise by ATC.

8. COMMUNICATIONS FOR VFR FLIGHTS

8.1 FAA Flight Service Stations (FSSs) and Supplemental Weather Service Locations (SWSLs) are allocated frequencies for different functions; for example, 122.0 MHz is assigned as the En Route Flight Advisory Service frequency at selected FSSs. In addition, certain FSSs provide Local Airport Advisory on 123.6 MHz. Frequencies are listed in the Airport/Facility Directory. If you are in doubt as to what frequency to use, 122.2 MHz is assigned to the majority of FSSs as a common en route simplex frequency.

Note.—In order to expedite communications, state the frequency being used and the aircraft location during initial call-up.

Example:

"DAYTON RADIO, THIS IS N12345 ON 122.2 MHz OVER SPRINGFIELD VOR, OVER."

8.1.1 Certain VOR voice channels are being utilized for recorded broadcasts, i.e., ATIS, HIWAS, etc. These services and appropriate frequencies are listed in the Airport/Facility Directory. On VFR flights, pilots are urged to monitor these frequencies. When in contact with a control facility, notify the controller if you plan to leave the frequency to monitor these broadcasts.

8.2 Hazardous Area Reporting Service

8.2.1 Selected Flight Service Stations provide flight monitoring where regularly traveled VFR routes cross large bodies of water, swamps, and mountains, for the purpose of expeditiously alerting Search and Rescue facilities when required.

8.2.1.1 When requesting the service either in person, by telephone or by radio, pilots should ask for the service desired and be prepared to give the following information — type of aircraft, altitude, indicated airspeed, present position, route of flight, heading.

8.2.1.2 Radio contacts are desired at least every 10 minutes. If contact is lost for more than 15 minutes, Search and Rescue will be alerted. Pilots are responsible for cancelling their request for service when they are outside the service area boundary. Pilots experiencing two-way radio failure are expected to land as soon as practicable and cancel their request for the service. The illustration in Appendix Two includes the areas and the FSS facilities involved in this program.

8.2.2 Long Island Sound Reporting Service (LIRS)

The New York and Bridgeport AFSSs provide Long Island Sound Reporting service on request for aircraft traversing Long Island Sound.

8.2.2.1 When requesting the service pilots should ask for SOUND REPORTING SERVICE and should be prepared to provide the following appropriate information: (1) Type and color of aircraft, (2) The specific route and altitude across the sound including the shore crossing point, (3) The overwater crossing time, (4) Number of persons on board, (5) True air speed.

8.2.2.2 Radio contacts are desired at least every 10 minutes, however, for flights of shorter duration a midsound report is requested. If contact is lost for more than 15 minutes, Search and Rescue will be alerted. Pilots are responsible for cancelling their request for the Long Island Sound Reporting Service when outside the service area boundary. Aircraft as soon as practicable and cancel their request for the service.

8.2.2.3 COMMUNICATIONS: Primary communications — pilot transmits 122.1 MHz and listens on the VOR frequency.

NEW YORK AFSS
- Hampton RCO ..... T122.6/R122.6 MHz
- Calverton VORTAC ..... T117.2 MHz
- Kennedy VORTAC ..... T115.9/R122.1 MHz

BRIDGEPORT AFSS
- Madison VORTAC ..... T110.4/R122.1 MHz
- Groton VOR ..... T111.8/R122.1 MHz
- Bridgeport VOR ..... T108.8/R122.1 MHz

8.2.3 Block Island Reporting Service (BIRS)

Within the Long Island Reporting Service, the New York FSS/IFSS also provides an additional service for aircraft operating between Montauk Point and Block Island. When requesting this service, pilots should ask for BLOCK ISLAND REPORTING SERVICE and should be prepared to provide the same flight information as that required for the Long Island Sound Reporting Service.

8.2.3.1 A minimum of three position reports are mandatory for this service. These are:

1. Report leaving Montauk Point or Block Island.
2. Midway report.
3. Report when over Montauk Point or Block Island at which time the pilot cancels the overwater service.

8.2.3.2 COMMUNICATIONS: Pilots are to transmit and receive on 122.6 MHz.

8.2.3.3 Pilots are advised that 122.6 MHz is a remote receiver located at the Hampton VORTAC site and designed to provide radio coverage between Hampton and Block Island. Flights proceeding beyond Block Island may contact the Bridgeport AFSS by transmitting on 122.1 MHz and listing on Groton VOR (TMU) frequency 111.8 MHz.

8.2.4 Cape Cod and Islands Radar Overwater Flight Following

In addition to normal VFR radar advisory service, traffic permitting, Otis Approach Control provides a radar overwater flight following service for aircraft traversing the Cape Code and adjacent Island area. Pilots desiring this service may contact Cape RAPCON on 118.2 MHz

8.2.4.1 Pilots requesting this service should be prepared to give the following information: (1) type and color of aircraft, (2) altitude, (3) position and heading, (4) route of flight, and (5) true airspeed.

8.2.4.2 For best radar coverage pilots are encouraged to fly at 1,500 feet MSL or above.

8.2.4.3 Pilots are responsible for cancelling their request for overwater flight following when they are over the mainland and/or outside the service area boundary.

9. OVER-WATER FLIGHTS RADIO PROCEDURE

9.1 Pilots should remember that there is a need to continuously guard the VHF emergency frequency 121.5 MHz when on long over-water flights, except when communications on other VHF channels, equipment limitations, or cockpit duties prevent simultaneous guarding of two channels. Guarding of 121.5 MHz is particularly critical when operating in proximity to flight information region (FIR) boundaries, for example, operations on Route R220 between Anchorage and Tokyo, since it serves to facilitate communications with regard to aircraft which may experience in-flight emergencies, communications, or navigational difficulities. (Reference ICAO Annex 10, Vol II Paras 5.2.2.1.1.1 and 5.2.2.1.1.2.)

LOCATION INDICATORS — ENCODE

*Indicates that the station is not connected to the AFTN.

Station	Code
A	
Abilene/Dyess AFB, Tex.	**KDYS**
Abilene/Municipal, Tex.	**KABI**
Adak/Davis, Alaska	**PADK**
Adams Field, see Little Rock	
Aerospace, see Mobile	
Agana, see Guam	
Aguidilla/Borinquen, Puerto Rico	**TJBQ**
Air Force Plant 42, see Palmdale	
Akron, Ohio	**KAKR**
Alameda/Alameda NAS, Calif.	**KNGZ**
Alamogordo/Holloman AFB, N.M.	**KHMN**
Albany/Albany, N.Y.	**KALB**
Albany/Albany NAS, Ga.	**KNAB**
Albert Whitted, see St. Petersburg	
Albrook AFB, see Balboa	
Albuquerque ATCC, N.M.	**KZAB**
Albuquerque/Intl, N.M.	**KABQ**
Alexander Hamilton, see St. Croix	
Alexandria/England AFB, La.	**KAEX**
Alexandria/Esler Field, La.	**KESF**
Alice/Intl, Tex.	**KALI**
Allen AAF, see Delta Junction	
Allen C. Thompson, see Jackson	
Altus/Altus AFB, Okla.	**KLTS**
Alvin Callendar NAS, see New Orleans	
Amarillo/Air Terminal, Tex.	**KAMA**
Anchorage/Anchorage Intl, Alaska	**PANC**
Anchorage/ATCC, Alaska	**PAZA**
Anchorage/Elmendorf AFB, Alaska	**PAED**
Anchorage/Merrill Field, Alaska	**PAMR**
Anderson AFB, see Guam	
Andrews AFB, see Camp Springs	
Angelina County, see Lufkin	
Annette Island, Alaska	**PANT**
Ardmore, Okla.	**KADM**
Atlanta/The William B. Hartsfield Atlanta Intl, Ga.	**KATL**
Atlanta ATCC, Hampton, Ga.	**KZTL**
Atlanta (FAA Southern Regional Office Message Center), Ga.	**KRTL**
Atlantic City/Atlantic City, N.J.	**KACY**
Austin/Bergstrom, Tex.	**KBSM**
Austin/Robert Mueller Municipal, Tex.	**KAUS**
Austin Straubel, see Green Bay	
B	
Baker I. Army AirField, Baker I.	**PBAR**
Bakersfield/Meadows Field, Calif.	**KBFL**
Baltimore/Baltimore — Washington Intl, Md.	**KBWI**
Bangor/Intl, Me.	**KBGR**
Barbers Point/Barbers Point NAS, Oahu I., Hawaii	**PHNA**
Barking Sands, Kauai, Hawaii	**PHBK**
Barksdale AFB, see Shreveport	
Barrow, Alaska	**PABR**
Barter Island, Alaska	**PABA**
Bates Field, see Mobile	
Baton Rouge/Ryan Field, La.	**KBTR**
Baudette, Minn.	**KBDE**
Beale AFB, see Marysville	
Beaufort/Beaufort MCAS, S.C.	**KNBC**
Beaumont — Port Arthur/Jefferson County, Tex.	**KBPT**
Bedford/Laurence G. Hanscom Field, Mass.	**KBED**
Beeville/Chase Field NAS, Tex.	**KNIR**
Belleville/Scott AFB, Ill.	**KBLV**
Bellingham/Intl, Wash.	**KBLI**
Bergstrom AFB, see Austin	
Bethel, Alaska	**PABE**
Bettles, Alaska	**PABT**
Big Delta (Army Arctic Cold Weather Test Center),	**PABG**
Biggs AAF, see El Paso	
Big Mountain (AFS), Alaska	**PABM**
Big Springs/Webb AFB, Tex.	**KBGS**
Biloxi/Kessler AFB, Miss.	**KBIX**
Birmingham, Ala.	**KBHM**
Bisbee Intl, see Douglas	
Blackrock, see Zuni Pueblo	
Blytheville/Blytheville AFB, Ark.	**KBYH**
Bob Sikes, see Crestview	
Boca Raton, Fla.	**KBCT**
Boise/Boise Air Terminal, Ida.	**KBOI**
Bolling AFB, see Washington	
Boone County, see Harrison	
Borinquen, see Aguadilla	
Boston ATCC, Nashua, N.H.	**KZBW**
Boston (FAA New England Regional Office Message Center) Mass.	**KRBN**
Boston — L.G. Hanscom Field, see Bedford	
Boston/Logan, Mass.	**KBOS**
Bowman, see Louisville	
Bradshaw Field, Hawaii I., Hawaii	**PHSF**
Brainard Field, see Hartford	
Broward County Intl, see Fort Lauderdale	
Brownsville/Intl, Tex.	**KBRO**
Brunswick/Brunswick NAS, Me.	**KNHZ**
Brunswick/Glynco NAS, Ga.	**KNEA**
Bryan/Coulter Field, Tex	**KCFD**
Bryand AAF, see Fort Richardson	
Buffalo/Greater Buffalo Intl, N.Y.	**KBUF**
Burbank/Hollywood — Burbank, Calif.	**KBUR**
Burlington/Intl, Vt.	**KBTV**

*Indicates that the station is not connected to the AFTN.

Station	Code
C	
Calexico/Intl, Calif.	**KCXL**
Campbell AAF, see Hopkinsville	
Camp Garcia Airstrip, see Vieques	
Camp Springs/Andrews AFB, Md.	**KADW**
Cannon AFB, see Clovis	
Cape Kennedy Regional, see Melbourne	
Cape Lisborne (AFS), Alaska	**PALU**
Cape May County, see Wildwood	
Cape Newenham (AFS), Alaska	**PAEH**
Cape Romanof (AFS), Alaska	**PACZ**
Cape Sarichef (AFS), Alaska	**PACS**
Caribou, Me.	**KCAR**
Carlsbad/Cavern City Air Terminal, N.M.	**KCNM**
Carswell AFB, see Fort Worth	
Carswell (USAF Automatic Digital Weather Switch), Tex.	**KAWN**
Castel AFB, see Merced	
Cavern City Air Terminal, see Carlsbad	
Chandler/Williams AFB, Ariz.	**KCHD**
Charleston/Municipal and AFB, S.C.	**KCHS**
Chase Field NAS, see Beeville	
Chattanooga/Lovell, Tenn.	**KCHA**
Cherry Point MCAS, N.C.	**KNKT**
Cheyenne, Wyo.	**KCYS**
Chicago ATCC, Aurora, Ill.	**KZAU**
Chicago/Chicago Midway, Ill.	**KMDW**
Chicago Metropolitan Area, Ill.	**KCHI**
Chicago (FAA Great Lakes Regional Office Message Center), Ill.	**KRGC**
Chicago/O'Hare, Ill.	**KORD**
Chico, Calif.	**KCIC**
Chicopee Falls/Westover AFB, Mass.	**KCEF**
Childress, Tex.	**KCDS**
Chisholm — Hibbing, see Hibbing	
Cincinnati/Greater Cincinnati Airport, Ohio	**KCVG**
Cincinnati/Municipal — Lunken Field, Ohio	**KLUC**
Clear (NEWS), Alaska	**PACL**
Cleveland ATCC, Oberlin, Ohio	**KZOB**
Cleveland/Cleveland — Hopkins Intl, Ohio	**KCLE**
Clovis/Cannon AFB, N.M.	**KCVS**
Coast Guard Station, Washington, D.C.	**KNMH**
Cocoa/Patrick AFB, Fla.	**KCOF**
Cold Bay, Alaska	**PACD**
College Station/Easterwood Field, Tex.	**KCLL**
Colorado Spring/Peterson Field, Colo.	**KCOS**
Columbus AFB, Miss.	**KCBM**
Columbus/Municipal, N.M.	**KCUS**
Columbus/Port Columbus Intl, Ohio	**KCMH**
Condron AAF, see White Sands Cordova, Alaska	**PACV**
Corpus Christi/Corpus Christi, NAS, Tex.	**KNGP**
Corpus Christi/Intl, Tex.	**KCRP**
Cotulla/Municipal, Tex.	**KCOT**
Coulter Field, see Bryan	
Craig AFB, see Selma	
Crestview/Bob Sikes, Fla	**KCEW**
Culebra, Puerto Rico	**TJCP**

*Indicates that the station is not connected to the AFTN.

Station	Code
Cutbank, Mont.	**KCTB**
D	
Dade — Collier Training and Transition Airport, see Miami	
Dalhart, Tex.	**KDHT**
Dallas/Hensley Field NAS, Tex.	**KNBE**
Dallas/Dallas — Love Field, Tex.	**KDAL**
Dallas — Fort Worth/Regional Airport, Tex.	**KDFW**
Davis, see Adak	
Davis, see Muskogee	
Davis Monthan AFB, see Tucson	
Dayton/James M. Cox — Dayton Municipal, Ohio	**KDAY**
Dayton/Wright — Patterson, Ohio	**KFFO**
Deadhorse, Alaska	**PASC**
Del Rio/Intl, Tex.	**KDRT**
Del Rio/Laughlin AFB, Tex.	**KDLF**
Delta Junction/Allen AAF, Alaska	**PABI**
Denver ATCC, Longmont, Colo.	**KZDV**
Denver/Stapleton Intl, Colo.	**KDEN**
Des Moines, Iowa	**KDSM**
Detroit/Detroit City, Mich.	**KDET**
Detroit/Metropolitan Wayne County, Mich.	**KDTW**
Detroit/Willow Run, Mich.	**KYIP**
Dillingham, Alaska	**PADL**
Dillingham AFB, see Oahu	
Dobbins AFB, see Marietta	
Dothan/Dothan, Ala.	**KDHN**
Douglas/Bisbee Intl, Ariz.	**KDUG**
Dover/Dover AFB, Del.	**KDOV**
Drake Field, see Fayetteville	
Driftwood Bay (AFS), Alaska	**PADF**
Dulles/Intl, see Washington	
Duluth/Intl, Minn.	**KDLH**
Du Page County, see West Chicago	
Dutch Harbor, Alaska	**PADU**
Dyess AFB, see Abilene	
E	
Eagle Pass/Municipal, Tex.	**KEGP**
Easterwood Field, see College Station	
Edward F. Knapp, see Montpelier	
Edwards/Edwards AFB, Calif.	**KEDW**
Eglin AFB, see Valparaiso	
Eielson AFB, see Fairbanks	
El Centro NAS, Calif.	**KNJK**
El Dorado/Goodwin Field, Ark.	**KELD**
Elizabeth City/CGAS — Municipal, N.C.	**KECG**
Ellington AFB, see Houston	
Ellsworth AFB, see Rapid City	
Elmendorf (AFB), see Anchorage	
El Paso/Biggs AAF, Tex.	**KBIF**
El Paso/Intl, Tex.	**KELP**
El Toro MCAS, Calif.	**KNZJ**
England AFB, see Alexandria	
Enid/Vance AFB, Okla.	**KEND**
Eniwetok, Marshall Is.	**PKMA**

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Station	Code
Eppley Air Field, see Omaha	
Esler Field, see Alexandria	
Everett/Snohomish County — Paine Field, Wash.	KPAE
F	
Fairbanks ATCC, Alaska	PAZF
Fairbanks/Eielson AFB, Alaska	PAEI
Fairbanks/Fairbanks Intl, Alaska	PAFA
Fairbanks/Wainwright, Alaska	PAFB
Fairchild AFB, see Spokane	
Fairfield/Travis AFB, Calif.	KSUU
Fajardo, Puerto Rico	TJFA*
Falmouth/Otis AFB, Mass.	KFMH
Farewell, Alaska	PAFW
Farmington, N.M.	KFMN
Fayetteville/Drake Field, Ark.	KFYV
Fayetteville/Pope AFB, N.C.	KPOB
Felts, see Spokane	
Florence/Municipal, S.C.	KFLO
Forbes AFB, see Topeka	
Fort Bragg/Simmons Army Air Field, N.C.	KFBG
Fort Lauderdale/Executive, Fla.	KFXE
Fort Lauderdale/Fort Lauderdale Hollywood Intl, Fla.	KFLL
Fort Myers/Page Field, Fla.	KFMY
Fort Richardson/Bryant AAF, Alaska	PAFR
Fort Smith/Municipal, Ark.	KFSM
Fort Worth ATCC, Euless, Tex.	KZFW
Fort Worth/Carswell AFB, Tex.	KFWH
Fort Worth (FAA Southwest Regional Office Message Center), Tex.	KRFW
Fort Worth/Meacham, Tex.	KFTW
Fort Worth (USAF Central NOTAM Facility) Tex.	KCNF
Fresno/Fresno Air Terminal, Calif.	KFAT
G	
Gage, Okla.	KGAG
Gainesville/Gainesville, Fla.	KGNV
Galena, Alaska	PAGA
Galveston/Scholes Field, Tex.	KGLS
Garden City, Kans.	KGCK
General Lyman Field, see Hilo	
General Mitchell Field, see Milwaukee	
George AFB, see Victorville	
Glynco NAS, see Brunswick	
Goldsboro/Seymour — Johnson AFB, N.C.	KGSB
Goodwin Field, see EL Dorado	
Grand Forks AFB, see Red River	
Grand Forks/Intl, N.D.	KGFK
Grand Rapids/Kent County Cascade, Mich.	KGRR
Grandeview/Richards — Gebaur AFB, Mo.	KGVW
Grants/Grants — Milan, N.M.	KGNT
Greater Buffalo Intl, see Buffalo	
Greater Cincinnati, see Cincinnati	
Greater Pittsburgh, see Pittsburgh	
Greater Wilmington, see Wilmington	
Great Falls/Intl Airport, Mont.	KGTF

*Indicates that the station is not connected to the AFTN.

Station	Code
Great Falls/Malmstrom AFB, Mont.	KGFA
Great Falls ATCC, Mont.	KZGT
Green Bay/Austin Straubel, Wis.	KGRB
Greenville/Majors Field, Tex.	KGVT
Greenville, Miss.	KGVS
Greenwood/Le Flore, Miss.	KGWO
Gregg County, see Longview	
Grider Field, see Pine Bluff	
Griffing, see Sandusky	
Griffiss AFB, see Rome	
Grissom AFB, see Peru	
Guam/Agana, NAS Mariana Is.	PGUM
Guam/Andersen AFB, Mariana Is.	PGUA
Guam (Fleet Weather Central), Mariana Is.	PGFW
Guam (Joint Typhoon Warning Center), Mariana Is.	PGTW
Guam/Taguac, Mariana Is.	PGAC
Guantanamo (US Naval Air Base), Cuba	MUGM*
Gulkana, Alaska	PAGK
Gwinn/K.I. Sawyer AFB, Mich.	KSAW
H	
Hampton/Langley AFB, Va.	KLFI
Hana, Maui, Hawaii	PHHN
Hancock Intl, see Syracuse	
Hanford/Lemoore NAS, Calif.	KNLC
Harlingen/Industrial Airpark, Tex.	KHRL
Harrisburg/Capital City, Pa.	KHAR
Harrisburg Intl — Olmsted Field, see Middletown	
Harrison/Boone County, Ark.	KHRO
Harry S. Truman, see St. Thomas	
Hartford/Brainard Field, Conn.	HFD
Havre, Mont.	KHVR
Hensley Field NAS, see Dallas	
Hickman (AFB), see Honolulu	
Hickory/Municipal, S.C.	KHKY
Hill AFB, see Ogden	
Hilo/General Lyman Field, Hawaii	PHTO
Hobart, Okla.	KHBR
Hobbs/Lea County, N.M.	KHOB
Holloman AFB, see Alamogordo	
Hollywood — Burbank, see Burbank	
Hollywood/North Perry, Fla.	KHWO
Homer, Alaska	PAHO
Homestead/Homestead AFB, Fla.	KHST
Honolulu/ATCC, Hawaii	PHZH
Honolulu/Hickam AFB, Oahu, Hawaii	PHIK
Honolulu/Honolulu Intl, Oahu, Hawaii	PHNL
Hopkinsville/Campbell AAF, Ky.	KNOP
Houghton Lake/Roscommon, Mich.	KHTL
Houlton/Intl, Me.	KHUL
Houston ATCC, Humble, Tex.	KZHU
Houston/Ellington AFB, Tex.	KEFD
Houston/Intercontinental, Tex.	KIAH
Houston/William P. Hobby, Tex.	KHOU

*Indicates that the station is not connected to the AFTN.

Station	Code
I	
Iliamna, Alaska	**PAIL**
Imperial/Imperial County, Calif.	**KIPL**
Indianapolis ATCC, Ind.	**KZID**
Indianapolis/Intl, Ind.	**KIND**
Indian Mountain (AFS), Alaska	**PAIM**
Indian Spring/Indian Spring AAF, Nev.	**KINS**
Industrial Airpark, see Harlingen	
International Falls, Minn.	**KINL**
Isla Grande, see San Juan	
Islip/MacArthur Field, N.Y.	**KISP**
J	
Jackson/Allen C. Thompson Field, Miss.	**KJAN**
Jacksonville, see Little Rock AFB, Ark.	
Jacksonville ATCC, Hillard, Fla.	**KZJX**
Jacksonville/Intl, Fla.	**KJAX**
Jacksonville/Jacksonville NAS, Fla.	**KNIP**
Jacksonville/New River MCAS, N.C.	**KNCA**
James Connally, see Waco	
James M. Cox — Dayton Municipal, see Dayton	
Jefferson County, see Beaumont —	**Port Arthur**
John F. Kennedy Intl, see New York	
Johnston I./Johnston Atoll, Johnston I	**PJON**
Jonesboro, Ark.	**KJBR**
Juneau, Alaska	**PAJN**
K	
Kaanapali, Maui I., Hawaii	**PHKP**
Kahului, Maui I., Hawaii	**PHOG**
Kailua — Kona/Kona, Hawaii	**PHKO**
Kaneohe, Oahu, Hawaii	**PHNG**
Kansas City ATCC, Olathe, Kans.	**KZKC**
Kansas City (FAA AFTN COM Center), Mo.	**KMKM**
Kansas City (FAA AFTN Central Regional Office Message Center), Mo.	**KRKC**
Kansas City (FAA National COM Center), Mo.	**KNKA**
Kansas City/Intl, Mo.	**KMCI**
Kansas City/Kansas City, Mo.	**KMKC**
Ke-ahole, see Kona	
Kessler AFB, see Biloxi	
Kelly AFB, see San Antonio	
Kenai, Alaska	**PAEN**
Kent County Cascade, see Grand Rapids	
Key West/Key West Intl, Fla.	**KEYW**
Key West/Key West NAS, Fla.	**KNQX**
Killeen/Robert Gray AAF, Tex.	**KGRK**
Kincheloe AFB, see Sault Ste. Marie	
King County Intl, see Seattle Boeing Field	
King Salmon, Alaska	**PAKN**
Kingsville NAS, Tex.	**KNQI**
Knobnoster/Whiteman AFB, Mo.	**KSZL**
Knoxville/McGee Tyson, Tenn.	**KTYS**
Kodiak, Alaska	**PADQ**
Kodiak/Municipal, Alaska	**PAWD**

*Indicates that the station is not connected to the AFTN.

Station	Code
Kona/Ke-ahole, Hawaii	**PHKO**
Koror, Caroline Is.	**PTRO**
Kosrae, Caroline Is.	**PTTK**
Kotzebue, Alaska	**PAOT**
Kunia, Hawaii	**PHKU**
Kusaie, Caroline Is.	**PTSA**
Kwajalein, Marshall Is.	**PKWA**
L	
La Guardia, see New York	
Lafayette/Regional, La.	**KLFT**
Lake Charles/Lake Charles, La.	**KLCH**
Lakehurst/Lakehurst NAS, N.J.	**KNEL**
Lambert — St. Louis Intl, see St. Louis	
Lanai City, Lanai, Hawaii	**PHNY**
Langley AFB, see Hampton	
Lansing/Capital Regional, Mich.	**KLAN**
Laredo/Intl, Tex.	**KLRD**
Las Vegas, N.M.	**KLVS**
Las Vegas/McCarran Intl, Nev.	**KLAS**
Las Vegas/Nellis AFB, Nev.	**KLSV**
Laughlin AFB, see Del Rio	
Laurence G. Hanscom Field, see Bedford	
Lea County, see Hobbs	
Lemoore NAS, see Hanford	
Lihue, Kauai, Hawaii	**PHLI**
Limestone/Loring AFB, Me.	**KLIZ**
Lincoln/Municipal, Neb.	**KLNK**
Lindbergh Field, see San Diego	
Little Rock/Adams Field, Ark.	**KLIT**
Little Rock AFB, see Jacksonville	
Logan Airport, see Boston	
Lompoc/Vandenburg AFB, Calif.	**KVBG**
Long Beach, Calif.	**KLGB**
Longview/Gregg County, Tex.	**KGGG**
Loring AFB, see Limestone	
Los Alamitos/Los Alamitos NAS, Calif.	**KNTB**
Los Angeles ATCC, Palmdale, Calif.	**KZLA**
Los Angeles (FAA Western Regional Office Message Center), Calif.	**KRLA**
Los Angeles/Intl, Calif.	**KLAX**
Louisville/Bowman, Ky.	**KLOU**
Lubbock/Regional, Tex.	**KLBB**
Lubbock/Reese AFB, Tex.	**KREE**
Lufkin/Angelina County, Tex.	**KLFK**
Luke AFB, see Phoenix	
Lunken Field, see Cincinnati	
M	
MacArthur Field, see Islip	
MacDill AFB, see Tampa	
Macon/Robins AFB, Ga.	**KWRB**
Madison/Truax Field, Wis.	**KMSN**
Majors Field, see Greenville	
Majuro, Marshall Islands	**PKMJ**
Malmstrom AFB, see Great Falls	
March AFB, see Riverside	

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Station	Code
Marietta/Dobbins, AFB, Ga.	**KMGE**
Marquette/Marquette County, Mich.	**KMQT**
Marysville/Beale AFB, Calif.	**KBAB**
Massena/Richards Field, N.Y.	**KMSS**
Mather AFB, see Sacramento	
Mathis Field, see San Angelo	
Maxwell AFB, see Montgomery	
Mayaguez, Puerto Rico	**TJMZ***
Mayport/Mayport USN Base, Fla.	**KNRB**
McAllen/Miller Intl, Tex.	**KMFE**
McAlester/Municipal, Okla.	**KMLC**
McCarran Intl, see Las Vegas	
McChord AFB, see Tacoma	
McClellan AFB, see Sacramento	
McConnell AFB, see Wichita	
McCoy AFB, see Orlando	
McGee Tyson, see Knoxville	
McGrath, Alaska	**PAMC**
McGuire AFB, see Wrightstown	
McGuire, see Fort Dix	
Meacham, see Fort Worth	
Meadowsfield, see Bakersfield	
Melbourne/Cape Kennedy Regional, Fla.	**KMLB**
Memphis/ATCC, Tenn.	**KZME**
Memphis/Intl, Tenn.	**KMEM**
Merced/Castle AFB, Calif.	**KMER**
Mercer County, see Trenton	
Merrill Field, see Anchorage	
Metropolitan Oakland Intl, see Oakland	
Miami ATCC, Fla.	**KZMA**
Miami/Dade — Collier Training and Transition Airport, Fla.	**KTNT**
Miami/Miami Intl, Fla.	**KMIA**
Miami/Opa Locka, Fla.	**KOPF**
Miami/New Tamiami, Fla.	**KTMB**
Mid — Continent, see Wichita	
Middletown/Harrisburgh Intl — Olmsted Field, Pa.	**KMDT**
Midland/Regional Air Terminal, Tex.	**KMAF**
Midway/Sand Island Field, Midway I.	**PMDY***
Miller Intl, see McAllen	
Millinocket/Millinocket, Me.	**KMLT**
Millville/Millville, N.J.	**KMIV**
Milwaukee/General Mitchell Field, Wis.	**KMKE**
Mineral Wells, Tex.	**KMWL**
Minneapolis ATCC, Farmington, Minn.	**KZMP**
Minneapolis/Minneapolis — St. Paul Intl, Minn.	**KMSP**
Minot/Intl, N. Dak.	**KMOT**
Minot/Minot AFB, N.D.	**KMIB**
Miramar NAS, Calif,	**KNKX**
Mobile/Bates Field, Ala.	**KMOB**
Mobile/Aerospace, Ala.	**KBFM**
Moffet NAS, see Mountain View	
Moisant Intl, see New Orleans	
Molokai/Molokai, Hawaii	**PHMK**
Monroe/Municipal, La.	**KMLU**
Montgomery/Maxell AFB, Ala.	**KMXF**
Montpelier/Edward F. Knapp, VT.	**KMPV**
Moody AFB, see Valdosta	
Mountain Home/Mountain Home AFB, Ida	**KMUO**
Mountain View/Moffett NAS, Calif.	**KNUQ**
Mount Clemens/Selfridge AFB, Mich.	**KMTC**
Muskogee/Davis, Okla.	**KMKO**
Myrtle Beach/Myrtle Beach, AFB, S.C.	**KMYR**

N

Nantucket, Mass.	**KACK**
Nashville/Metropolitan, Tenn.	**KBNA**
Nellis AFB, see Las Vegas	
Newark/Intl, N.J.	**KEWR**
New Bern/Simons — Nott, N.C.	**KEWN**
Newburgh/Stewart, N.Y.	**KSWF**
New Hanover County, see Wilmington	
New Orleans/Alvin Callender NAS, La.	**KNBG**
New Orleans/Intl, La.	**KMSY**
New Orleans/New Orleans, La.	**KNEW**
Newport News/Patrick Henry, Va.	**KPHF**
New River MCAS, see Jacksonville	
New Tamiami, see Miami	
New York ATCC, Ronkonkoma, N.Y.	**KZNY**
New York (City), N.Y.	**KNYC**
New York (FAA Eastern Regional Office Message Center), N.Y.	**KRNY**
New York/John F. Kennedy Intl, N.Y.	**KJFK**
New York/La Guardia, N.Y.	**KLGA**
Niagara Falls/Intl, N.Y.	**KIAG**
Nogales/Intl, Ariz.	**KOLS**
Nome, Alaska	**PAOM**
Norfolk/Norfolk Regional Airport, VA.	**KORF**
Norfolk/Norfolk NAS, Va.	**KNGU**
North Island NAS, see San Diego	
North Perry, see Hollywood	
North Philadelphia, see Philadelphia	
Northway, Alaska	**PAOR**
Norton AFB, see San Bernardino	

O

Oahu (USAF Solar Flare Forecast Facility), Hawaii	**PHFF**
Oahu/Wheeler AFB, Hawaii	**PHHI**
Oahu/Dillingham AFB, Hawaii	**PHDH**
Oakland ATCC, Freemont, Calif.	**KZOA**
Oakland/Metropolitan Oakland Intl, Calif.	**KOAK**
Oceana NAS, see Virginia Beach	
Offutt AFB, Omaha, Nebr.	**KOFF**
Offutt AFB, Omaha, (USAF Global Weather Center), Nebr.	**KGWC**
Ogden/Hill AFB, Utah	**KHIF**
Ogdensburg, N.Y.	**KOGS**
O'Hare, see Chicago	
Oklahoma City/Aeronautical Center, Okla.	**KOEX**
Oklahoma City/Tinker AFB, Okla.	**KTIK**
Oklahoma City/Will Rogers World, Okla.	**KOKC**
Olmstead Field, see Middletown	
Omaha/Eppley Air Field, Nebr.	**KOMA**
Ontario/Ontario Intl, Calif.	**KONT**
Opa Locka, see Miami	
Orlando, Fla.	**KORL**

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Station	Code
Orlando/McCoy AFB, Fla.	KMCO
Oscoda/Wurtsmith AFB, Mich.	KOSC
Otis AFB, see Falmouth	
P	
Page Field, see Fort Myers	
Pago Pago/Pago Pago Intl, Tutuila Island, American Samoa	NSTU
Paine Field, see Everett	
Palacios, Tex.	KPSX
Palm Beach, see West Palm Beach	
Palm Beach County Park, see West Palm Beach	
Palmdale/Air Force Plant 42, Calif.	KPMD
Palmer, Alaska	PAAQ
Panama City/Tyndall AFB, Fla.	KPAM
Patrick AFB, see Cocoa	
Patrick Henry, see Newport News	
Patuxent River/Patuxent River NAS, Md.	KNHK
Pearl Harbour (Navy Communications Center), Hawaii	PHNC
Pease AFB, see Portsmouth	
Pembina, N. Dak.	KPMB
Pensacola/Regional, Fla	KPNS
Pensacola/Pensacola NAS, Fla.	KNPA
Peru/Grissom AFB, Ind.	KGUS
Peterson Field, see Colorado Springs	
Philadelphia/North Philadelphia, Pa.	KPNE
Philadelphia/Intl, Pa.	KPHL
Phoenix/Luke AFB, Ariz.	KLUF
Phoenix/Sky Harbor Intl, Ariz.	KPHX
Pine Bluff/Grider Field, Ark.	KPBF
Pittsburgh/Greater Pittsburgh, Pa.	KPIT
Plattsburgh/Plattsburgh AFB, N.Y.	KPBG
Point Barrow, Alaska	PAPB
Point Mugu NAS, Calif.	KNTD
Ponape I., Caroline Is.	PTPN
Ponca City, Okla.	KPNC
Ponce/Mercedita, Puerto Rico	TJPS*
Pope AFB, see Fayetteville	
Port Angeles CGAS, Wash.	KNOW
Port Columbus Intl, see Columbus	
Port Huron, Mich.	KPHN
Portland/Intl, Ore.	KPDX
Portland/Intl Jetport, Me.	KPWM
Port Moller (AFS), Alaska	PAPM
Portsmouth/Pease AFB, N.H.	KPSM
Pounds Field, see Tyler	
Presque Isle/Presque Isle, Me.	KRQI
Providence/Theodore Francis Greene State, R.I.,	KPVD
Pueblo/Memorial, Col.	KPUB
Puerto Rico Intl, see San Juan	
R	
Raleigh/Raleigh — Durham, N.C.	KRDU
Ramey (USAF Solar Flare Forecast Facility), Puerto Rico	TJFF*
Rantoul/Chanute AFB, Ill.	KRAN

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Station	Code
Rapid City/Ellsworth AFB, S.D.	KRCA
Red River/Grand Forks AFB, N.D.	KRDR
Reese AFB, see Lubbock	
Reno/Intl, Nev.	KRNO
Richard Evelyn Byrd Intl, see Richmond	
Richards Field, see Massena	
Richards — Gebaur AFB, see Grandview	
Richmond/Richard Evelyn Bird Intl, Va.	KRIC
Rickenbacker AFB, Ohio	KLCK
Riverside/March AFB, Calif.	KRIV
Robert Gray, see Killeen	
Robert Mueller Municipal, see Austin	
Rochester/Rochester — Monroe County, N.Y.	KROC
Rome/Griffiss AFB, N.Y.	KRME
Roosevelt Roads NAS, Puerto Rico	TJNR
Roscommon, see Houghton Lake	
Roswell/Industrial Air Center, N.M.	KROW
Rota, Mariana Is.	PGRO
Ryan Field, see Baton Rouge	
S	
Sacramento/Mather AFB, Calif.	KMHR
Sacramento/McClellan AFB, Calif.	KMCC
Sacramento/Executive, Calif.	KSAC
Sacramento/Sacramento Metropolitan, Calif.	KSMF
St. Croix/Alexander Hamilton, Virgin Is.	TISX
St. Louis/Lambert — St. Louis Intl, Mo.	KSTL
St. Paul Island, Alaska	PASN
St. Petersburg/Clearwater Intl, Fla.	KPIE
St. Petersburg/Albert Whitted, Fla.	KSPG
St. Thomas/Harry S. Truman, Virgin Is.	TIST
Saipan I. (Obyan)/Intl, Mariana Is.	PGSN
Salisbury/Wicomico County, Md.	KSBY
Salt Lake City/Intl, Utah	KSLC
Salt Lake City/ATCC, Utah	KZLC
San Angelo/Mathis Field, Tex.	KSJT
San Antonio/Kelly AFB, Tex.	KSKF
San Antonio/Intl, Tex.	KSAT
San Antonio/Randolph AFB, Tex.	KRND
San Bernardino/Norton AFB, Calif.	KSBD
San Clementa USN AAB, Calif.	KSCI
San Diego CGAS, Calif.	KDCG
San Diego/Intl, Lindbergh Field, Calif.	KSAN
San Diego/North Island NAS, Calif.	KNZY
Sandusky/Griffing, Ohio	KSKY
San Francisco CGAS, Calif.	KSFS
San Francisco/San Francisco Intl, Calif.	KSFO
San Island Field, see Midway Island	
San Juan/Isla Grande, Puerto Rico	TJIG*
San Juan ATCC, Puerto Rico	TJZS
San Juan/Puerto Rico Intl, Puerto Rico	TJSJ
San Nicolas I./San Nicholas AAB, Calif.	KNSI
Santa Fe, N.M.	KSAF
Sault Ste. Marie/Sault Ste. Marie Municipal, Mich.	KSSM
Savannah/Savannah Municipal, Ga.	KSAV
Sawyer AFB, see Gwinn	
Scholes Field, see Galveston	
Scott AFB, see Belleville	

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Station	Code
Seattle ATC, Auburn, Wash.	KZSE
Seattle Boeing Field/King County. Intl, Wash.	KBFI
Seattle/Seattle Tacoma Intl, Wash.	KSEA
Seattle (FAA Northwest Regional Office Message Center), Wash.	KRSE
Selfield, see Selma	
Selfridge AFB, see Mount Clemens	
Selma/Craig AFB, Ala.	KSEM
Selma/Selfield, Ala.	KSES
Seymour — Johnson AFB, see Goldsboro	
Shaw AFB, see Sumter	
Shemya/Shemya, Alaska	PASY
Sheppard AFB and Municipal, see Wichita Falls	
Shreveport/Barksdale AFB, La.	KBAD
Shreveport/Regional, La.	KSHV
Simmons — Nott, see New Bern	
Sioux City, Iowa	KSUX
Sitka, Alaska	PASI
Sky Harbor Intl, see Phoenix	
Smith — Reynolds, see Winston — Salem	
Smyrna/Sewart AFB, Tenn.	KSYM
Snohomish County, see Everett	
South Weymouth/South Weymouth NAS, Mass.	KNZW
Southwest Florida Regional Airport	KRSW
Sparrevohn (AFS), Alaska	PASV
Spokane/Fairchild AFB, Wash.	KSKA
Spokane/Felts, Wash.	KSFF
Spokane/Intl, Wash.	KGEG
Stapleton Intl, see Denver	
Stewart, see Newburgh	
Stockton/Stockton Metropolitan Calif.	KSCK
Suffolk County, see West Hampton Beach	
Sumter/Shaw AFB, S.C.	KSSC
Swan, I.	KSWA
Syracuse/Hancock Intl, N.Y.	KSYR

T

Tacoma Intl, see Seattle	
Tacoma/McChord AFB, Wash	KTCM
Talkeetna, Alaska	PATK
Tallahassee/Municipal, Fla.	KTLH
Tampa/MacDill AFB, Fla.	KMCF
Tampa/Intl, Fla.	KTPA
Tanana, Alaska	PATA
Tatalina (AFS), Alaska	PATL
Teterboro, N.J.	KTEB
Theodore Francis Greene State, see Providence	
Tin City (AFS), Alaska	PATC
Tinker AFB, see Oklahoma City	
Topeka/Forbes AFB, Kans.	KFOE
Travis AFB, see Fairfield	
Trenton/Mercer County, N.J.	KTTN
Truax Field, see Madison	
Truk, Caroline Is.	PTKK
Truth or Consequences/Municipal, N.M.	KTCS
Tucson/Davis Monthan AFB, Ariz.	KDMA
Tucson/Intl, Ariz.	KTUS
Tucumcari, N.M.	KTCC

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Station	Code
Tulsa/Intl, Okla.	KTUL
Tyler/Pounds Field, Tex.	KTYR
Tyndall AFB, see Panama City	

U

Unalakleet, Alaska	PAUN

V

Valdez, Alaska	PAVD
Valdosta/Moody AFB, Ga.	KVAD
Valparaiso/Eglin AFB, Fla.	KVPS
Vance AFB, see Enid	
Vandenburg AFB, see Lompoc	
Vero Beach/Vero Beach, Fla.	KVRB
Victorville/George AFB, Calif.	KVCV
Vieques/Camp Garcia Airstrip, Puerto Rico	TJCG*
Vieques, Puerto Rico	TJVQ*
Vincent M C A S, see Yuma	
Virginia Beach/Oceana NAS, Va.	KNTU

W

Waco/James Connally, Tex.	KCNW
Waco/Waco Municipal, Tex.	KACT
Waimea — Kohala, Kameula, Hawaii	PHMU
Wainwright AAF, see Fairbanks	
Wainwright (DEW STN), Alaska	PAWT
Wake, Wake I.	PWAK
Wallops I./Wallops Station, Va.	KWAL
Washington ATCC, Leesburg, Va.	KZDC
Washington/Bolling AFB, Washington, D.C.	KBOF
Washington (Central Altitude Reservation Facility), D.C.	KARF
Washington/Dulles Intl, D.C.	KIAD
Washington (FAA ATC Systems Command Center), D.C.	KDCC
Washington (FAA Washington Office Message Center), D.C.	KRWA
Washington/National, D.C.	KDCA
Washington/National Flight Data Center, D.C.	KFDC
Washington (National Meteorological COM Center), D.C.	KWBC
Watertown/Intl, N.Y.	KART
Webb AFB, see Big Spring	
Webb Field, see Texarkana	
Wendover/Wendover AAB, Utah	KENV
West Chicago/Du Page County, Ill.	KDPA
West Hampton Beach/Suffolk County N.Y.	KFOK
Westover AFB, see Chicopee Falls	
West Palm Beach/Palm Beach, Fla.	KPBI
West Palm Beach/Palm Beach County Park, Fla.	KLNA
Wheeler AFB, see Oahu	
Whidbey I./Whidbey I., NAS, Wash	KNUW
Whiteman AFB, See Knobnoster	
White Plains/Westchester, N.Y.	KHPN
White Sands/Condron AAF, N.M.	KWSD
Wichita Falls/Sheppard AFB and Municipal, Tex.	KSPS

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Station	Code
Wichita/McConnell AFB, Kans.	**KIAB**
Wichita/Mid — Continent, Kans.	**KICT**
Wicomico County, see Salisbury	
Wildwood, Alaska	**PAWW**
Wildwood/Cape May County, N.J.	**KWWD**
William B. Hartsfield, Atlanta Intl, see Atlanta	
William P. Hobby, see Houston	
Williams AFB, see Chandler	
Williston/Intl, N.D.	**KISN**
Willow Run, see Detroit	
Willow Grove/Willow Grove, NAS, Pa.	**KNXX**
Will Rogers World, see Oklahoma City	
Wilmington/Greater Wilmington, Del.	**KILG**
Wilmington/New Hanover County, N.C.	**KILM**
Windsor Locks/Bradley Intl, Conn.	**KBDL**
Wink/Winkler County, Tex.	**KINK**
Winston Salem/Smith — Reynolds, N.C.	**KINT**
Wright — Patterson, see Dayton	

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Station	Code
Wrightstown/McGuire AFB, N.J.	**KWRI**
Wurtsmith AFB, see Oscoda	
X	
Yakutat, Alaska	**PAYA**
Yap, Caroline Is.	**PTYA**
Youngstown, Ohio	**KYNG**
Yuma/Yuma MCAS/Yuma Intl, Ariz.	**KYUM**
Yuma/Vincent MCAS, Ariz.	**KNYL**
Z	
Zuni Pueblo/Blackrock, N.M.	**KZUM**

LOCATION INDICATORS — DECODE

UNITED STATES

KABE	ALLENTOWN-BETHLEHEM-EASTON,ALLENTOWN.PA.
KABI	ABILENE REGIONAL, ABILENE, TX.
KABQ	ALBUQUERQUE INTL, ALBUQUERQUE, NM.
KKABR	ABERDEEN REGIONAL, ABERDEEN, SD.,
KKABY	SOUTHWEST GEORGIA REGIONAL, ALBANY,GA.
KACK	NANTUCKET MEMORIAL, NANTUCKET, MA.
KACT	WACO REGIONAL, WACO, TX.
KACV	ARCATA, ARCATA/EUREKA, CA.
KACY	ATLANTIC CITY INTERNATIONAL, ATLANTIC CITY, NJ.
KADW	ANDREWS AFB, CAMP SPRINGS, MD.
KAEX	ENGLAND AFB, ALEXANDRIA, LA.
KAFW	FORT WORTH ALLIANCE, FORT WORTH, TX.
KAGC	ALLEGHENY COUNTY, PITTSBURGH, PA.
KAGS	BUSH FIELD, AUGUSTA, GA.
KAHN	ATHENS/BEN EPPS, ATHENS, GA.
KALB	ALBANY COUNTY, ALBANY, NY.
KALI	ALICE INTL, ALICE, TX.
KALM	ALAMOGORDO-WHITE SANDS REGIONAL,ALAMOGORDO, NM.
KALN	ST LOUIS REGIONAL, ALTON/ST LOUIS, IL.
KALO	WATERLOO MUNI, WATERLOO, IA.
KALW	WALLA WALLA REGIONAL, WALLA WALLA, WA.
KAMA	AMARILLO INTL, AMARILLO, TX.
KANB	ANNISTON METROPOLITAN, ANNISTON, AL.
KAND	ANDERSON COUNTY, ANDERSON, SC.
KAOO	ALTOONA-BLAIR COUNTY, ALTOONA, PA.
KAPF	NAPLES MUNI, NAPLES, FL.
KAPG	PHILLIPS AAF, ABDERDEEN PROVING GROUND, ABERDEEN, MD.
KAPN	ALPENA COUNTY REGIONAL, ALPENA, MI.
KART	WATERTOWN INTERNATIONAL, WATERTOWN, NY.
KASE	ASPEN-PITKIN CO/SARDY FIELD, ASPEN, CO.
KATL	THE WILLIAM B HARTSFIELD ATLANTA INTL, ATLANTA, GA.
KATY	WATERTOWN MUNI, WATERTOWN, IA.
KAUS	ROBERT MUELLER MUNI, AUSTIN, TX.
KAVL	ASHEVILLE REGIONAL, ASHEVILLE, NC.
KAVP	WILKES-BARRE/SCRANTON INTL, WILKES-BARRE/SCRANTON, PA.
KAWN	CARSWELL (USAF AUTOMATIC DIGITAL WEATHER SWITCH) FT.WORTH, TX.
KAXN	CHANDLER FIELD, ALEXANDRIA, MN.
KAYE	MOORE AAF, FT. DEVENS/AYER, MA.
KAZO	KALAMAZOO/BATTLE CREEK INTL, KALAMAZOO, MI. B
KBAB	BEALE AFB, MARYSVILLE, CA.
KBAD	BARKSDALE AFB, BOSSIER CITY, LA.
KBAF	BARNES MUNI, WESTFIELD, MA.
KBAK	COLUMBUS MUNI, COLUMBUS, IN.
KBCT	BOCA RATON, BOCA RATON, FL.
KBDE	BAUDETTE INTL, BAUDETTE, MN.
KBDL	BRADLEY INTL, WINDSOR LOCKS, CT.
KBDR	IGOR I SIKORSKY MEMORIAL, BRIDGEPORT, CT.
KBED	LAURENCE G HANSCOM FLD, BEDFORD, MA.
KBFD	BRADFORD REGIONAL, BRADFORD, PA.
KBFF	WILLIAM B. HEILIG FIELD, SCOTTSBLUFF, NE.
KBFI	BOEING FIELD/KING COUNTY INTL, SEATTLE, WA.
KBFL	MEADOWS FIELD, BAKERSFIELD, CA.
KBFM	MOBILE DOWNTOWN, MOBILE, AL.
KBGM	BINGHAMTON REGIONAL/EDWIN A LINKFIELD, BINGHAMTON, NY.
KBGR	BANGOR INTL, BANGOR, ME.
KBHM	BIRMINGHAM, BIRMINGHAM, AL.
KBIF	BIGGS AAF, FORT BLISS/EL PASO, TX.
KBIL	BILLINGS LOGAN INTL, BILLINGS, MT.
KBIS	BISMARCK MUNI, BISMARCK, ND.
KBIX	KEESLER AFB, BILOXI, MS.
KBKF	BUCKLEY ANGB, AURORA, CO.
KBKL	BURKE LAKEFRONT, CLEVELAND, OH.
KBKW	RALEIGH COUNTY MEMORIAL, BECKLEY, WV.
KBLI	BELLINGHAM INTL, BELLINGHAM, WA.
KBLV	SCOTT AFB, BELLEVILLE, IL.
KBMG	MONROE COUNTY, BLOOMINGTON, IN.
KBMI	BLOOMINGTON/NORMAL, BLOOMINGTON, IL.
KBNA	NASHVILLE INTERNATIONAL, NASHVILLE, TN.
KBOF	BOLLING AFB, WASHINGTON, DC.
KBOI	BOISE AIR TERMINAL /GOWEN FLD/, BOISE, ID.
KBOS	GENERAL EDWARD LAWRENCE LOGAN INTL, BOSTON, MA.
KBPT	JEFFERSON COUNTY, BEAUMONT/PORT ARTHUR, TX.
KBQK	GLYNCO JETPORT, BRUNSWICK, GA.
KBRL	BURLINGTON MUNI, BURLINGTON, IA.
KBRO	BROWNSVILLE/SOUTH PADRE ISLAND INT'L, BROWNSVILLE, TX.
KBSM	BERGSTROM AFB, AUSTIN, TX.
KBTL	W K KELLOGG, BATTLE CREEK, MI.
KBTM	BERT MOONEY, BUTTE, MT.
KBTR	BATON ROUGE METROPOLITAN, RYAN FIELD, BATON ROUGE, LA.
KBTV	BURLINGTON INTL, BURLINGTON, VT.
KBUF	GREATER BUFFALO INTL, BUFFALO, NY.
KBUR	BURBANK-GLENDALE-PASADENA, BURBANK, CA.
KBWG	BOWLING GREEN-WARREN COUNTY REGIONAL, BOWLING GREEN, KY.
KBWI	BALTIMORE-WASHINGTON INTL, BALTIMORE, MD.
KBYH	EAKER AFB, BLYTHVILLE, AR.
KBYI	BURLEY MUNI, BURLEY, ID.

KBYS BICYCLE LAKE AAF, FT IRWIN/BARSTOW, CA.
KBZN GALLATIN FIELD, BOSEMAN, MT.C
KCAE COLUMBIA METROPOLITAN, COLUMBIA, SC.
KCAK AKRON-CANTON REGIONAL, AKRON, OH.
KCAR CARIBOU MUNI, CARIBOU, ME.
KCBM COLUMBUS AFB, COLUMBUS, MS.
KCDC CEDAR CITY MUNI, CEDAR CITY, UT.
KCEC JACK MCNAMARA FIELD ARPT, CRESCENT CITY, CA.
KCEF WESTOVER AFB/METROPOLITAN, SPRINGFIELD/CHICOPEE, MA.
KCEW BOB SIKES AIRPORT, CRESTVIEW, FL.
KCFC FAA ATC SYSTEMS COMMAND CENTER, WASHINGTON, DC.
KCGF CUYAHOGA COUNTY, CLEVELAND, OH.
KCGI CAPE GIRARDEAU MUNI, CAPE GIRARDEAU, MO.
KCGJ MC CONNELL ANG BASE, WITCHITA, KS.
KCGX MERRILL C MEIGS, CHICAGO, IL.
KCHA LOVELL FIELD, CHATTANOOGA, TN.
KCHO CHARLOTTESVILLE-ALBEMARLE, CHARLOTTESVILLE, VA.
KCHS CHARLESTON AFB/INTL, CHARLESTON, SC.
KCID CEDAR RAPIDS MUNI, CEDAR RAPIDS, IA.
KCIU CHIPPEWA COUNTY INTL, SAULT STE MARIE, MI.
KCKB BENEDUM, CLARKSBURG, WV.
KCLE CLEVELAND-HOPKINS INTL, CLEVELAND, OH.
KCLL EASTERWOOD FIELD, COLLEGE STATION, TX.
KCLM WILLIAM R FAIRCHILD INTL, PORT ANGELES, WA.
KCLT CHARLOTTE/DOUGLAS INTL, CHARTLOTTE, NC.
KCMC NORAD WEATHER SUPPORT UNIT, CHEYENNE MOUNTAIN AFS, CO.
KCMH PORT COLUMBUS INTL, COLUMBUS, OH.
KCMI UNIVERSITY OF ILLINOIS-WILLARD, CHAMPAIGN/URBANA, IL.
KCMX HOUGHTON COUNTY MEMORIAL, HOUGHTON, MI.
KCNF U.S.NOTAM SYSTEM, WASHINGTON, DC.
KCNM CAVERN CITY AIR TERMINAL, CALSBAD, NM.
KCOF PATRICK AFB, COCOA BEACH, FL.
KCOS CITY OF COLORADO SPRINGS MUNI, COLORADO SPRINGS, CA.
KCOU COLUMBIA REGIONAL, COLUMBIA, MO.
KCPR NATRONA COUNTY INTL, CASPER, WY.
KCRP CORPUS CHRISTI INTL, CORPUS CHRISTI, TX.
KCRW YEAGER, CHARLESTON, WV.
KCSG COLUMBUS METROPOLITAN, COLUMBUS, GA.
KCTB CUT BANK MUNI, CUT BANK MT.
KCVG CINCINNATI/NORTHERN KENTUCKY INTERNATIONAL, COVINGTON, KY.
KCSV CROSSVILLE MEMORIAL, CROSSVILLE, TN.
KCVO CORVALLIS MUNI, OR.
KCVS CANNON AFB, CLOVIS, NM.
KCXL CALEXICO INTL, CALEXICO, CA.
KCXO MONTGOMERY COUNTY, CONROE, TX.
KCYS CHEYENNE, CHEYENNE, WY. D
KDAA DAVISON AAF, FT BELVOIR, VA.
KDAB DAYTONA BEACH REGIONAL, DAYTONA BEACH, FL.
KDAL DALLAS LOVE FIELD, DALLAS, TX.
KDAN DANVILLE REGIONAL, DANVILLE, VA.
KDAY JAMES M COX DAYTON INTL, DAYTON, OH.
KDBQ DUBUQUE REGIONAL, DUBUQUE, IA.
KDCA WASHINGTON NATIONAL, WASHINGTON, DC.
KDDC DODGE CITY REGIONAL, DODGE CITY, KS.
KDEC DECATUR, DECATUR, IL.
KDEN STAPLETON INTL, DENVER, CO.
KDET DETROIT CITY, DETROIT, MI.
KDFW DALLAS/FORT WORTH INTERNATIONAL, DALLAS, TX.
KDHN DOTHAN, DOTHAN, AL.
KDLF LAUGHLIN AFB, DEL RIO, TX.
KDLH DULUTH INTL, DULUTH, MN.
KDMA DAVIS-MONTHAN AFB, TUSCON, AZ.
KDMN DEMING MUNI, DEMING, NM.
KDOV DOVER AFB, DOVER, DE.
KDRI BEAUREGARD PARISH ARPT, DE RIDDER, LA.
KDSM DES MOINES INTL, DES MOINES, IA.
KDTW DETROIT METROPOLITAN WAYNE COUNTY, DETROIT, MI.
KDUJ DU BOIS/JEFFERSON COUNTY, DU BOIS, PA.
KDYS DYESS AFB, ABILENE, TX. E
KEAU EAU CLAIRE COUNTY, EAU CLAIRE, WI.
KECG ELIZABETH CITY CG BASE, ELIZABETH CITY, NC.
KEDW EDWARDS AFB, EDWARDS, CA.
KEEN DILLANT-HOPKINS, KEENE, NH.
KEGE EAGLE COUNTY, EAGLE, CO
KEKN JENNINGS RANDOLPH FLD, ELKINS, WV.
KEKO ELKO MUNI-J.C. HARRIS FIELD, ELKO, NV.
KELD GOODWIN FILED, ELDORADO, AR.
KELM ELMIRA/CORNING REGIONAL, ELMIRA, NY.
KELP EL PASO INTL, EL PASO, TX.
KEND VANCE AFB, ENID, OK.
KENW KENOSHA REGIONAL, KENOSHA, WI.
KERI ERIE INTL, ERIE, PA.
KESF ALEXANDRIA ESLER REGIONAL, ALEXANDRIA, LA.
KEUG MAHLON SWEET FIELD, EUGENE, OR.
KEVV EVANSVILLE REGIONAL, EVANSVILLE, IN.
KEWN CRAVEN COUNTY REGIONAL, NEW BERN, NC.
KEWR NEWARK INTL, NEWARK, NL.
KEYW KEY WEST INTL, KEY WEST, FL. F
KFAR HECTOR INTERNATIONAL, FARGO, ND.
KFAT FRESNO AIR TERMINAL, FRESNO, CA.
KFAY FAYETTEVILLE REGIONAL/GRANNIS FIELD, FAYETTEVILLE, NC.
KFBG SIMMONS AAF, FORT BRAGG, NC.
KFFO WRIGHT-PATTERSON AFB, DAYTON, OH.
KFHU LIBBY AAF/SIERRA VISTA MUNI, FORT HUACHUCA, AZ.
KFLG FLAGSTAFF PULLIAM, FLAGSTAFF, AZ.

KFLL	FORT LAUDERDALE/HOLLYWOOD INTL, FORT LAUDERDALE, FL.
KFLO	FLORENCE REGIONAL, FLORENCE, SC.
KFLV	SHERMAN AAF, FORT LEAVENWORTH, KS.
KFME	TIPTON AAF, FT. MEAD/ODENTON, MD.
KFNT	BISHOP INTERNATIONAL, FLINT, MI.
KFOD	FORT DODGE REGIONAL, FORT DODGE, IA.
KFOE	FORBES FIELD, TOPEKA, KS.
KFRI	MARSHALL AAF, FT. RILEY, KS.
KFRG	REPUBLIC, FARMINGDALE, NY.
KFSD	JOE FOSS FIELD, SIOUX FALLS, SD.
KFSI	HENRY POST AAF, FT. SILL, OK.
KFSM	FORT SMITH REGIONAL, FORT SMITH, AR.
KFTK	GODMAN AAF, FT. KNOX, KY.
KFTW	FORT WORTH MEACHAM, FORT WORTH, TX.
KFTY	FULTON COUNTY-BROWN FIELD, ATLANTA, GA.
KFWA	FORT WAYNE INTERNATIONAL, FORT WAYNE, IN.
KFWH	CARSWELL AFB, FORT WORTH, TX.
KFYV	DRAKE FIELD, FAYETTEVILLE, AR. G
KGCK	GARDEN CITY MUNI, GARDEN CITY, KS.
KGCN	GRAND CANYON NATIONAL PARK, GRAND CANYON, AZ.
KGEG	SPOKANE INTL, SPOKANE, WA.
KGFA	MALMSTROM AFB. GREAT FALLS. MT.
KGFK	GRAND FORKS INTL, GRAND FORKS, ND.
KGFL	WARREN COUNTY, GLENS FALLS, NY.
KGGG	GREGG COUNTY, LONGVIEW, TX.
KGJT	WALKER FIELD,
KGLS	SCHOLES FIELD, GALVESTON, TX.
KGNV	GAINESVILLE REGIONAL, GAINESVILLE, FL.
KGON	GROTON-NEW LONDON, GROTON-NEW LONDON, CT.
KGPT	GULFPORT-BILOXI RGNL, GULFPORT, MS.
KGRB	AUSTIN STRAUBEL INTERNATIONAL, GREEN BAY, WI.
KGRF	GRAY AAF, FORT LEWIS/TACOMA, WA.
KGRI	CENTRAL NEBRASKA REGIONAL, GRANDE ISLAND, NE.
KGRK	ROBERT GRAY AAF, FORT HOOD/KILLEEN, TX.
KGRR	KENT COUNTY INTL, GRAND RAPIDS, MI.
KGSB	SEYMOUR JOHNSON AFB, GOLDSBORO, NC.
KGSO	PIEDMONT TRIAD INTERNATIONAL, GREENSBORO, NC.
KGSP	GREENVILLE-SPARTANBURG, GREER, SC.
KGTB	WHEELER-SACK AAF, FORT DRUM, NY.
KGTF	GREAT FALLS INTL, GREAT FALLS, MT.
KGUP	GALLUP MUNI, GALLULP, NM.
KGUS	GRISSOM AFB, PERU, IN.
KGVW	RICHARDS-GEBAUR APRT, KANSAS CITY, MO.
KGWO	GREENWOOD-LEFLORE APRT, GREENWOOD, MS.
KGYY	GARY REGIONAL, GARY, IN. H
KHFD	HARTFORD-BRAINARD, HARTFORD, CT.
KHGR	WASHINGTON COUNTY REGIONAL, HAGERSTOWN, MD.
KHHR	HAWTHORNE MUNI, HAWTHORNE, CA.
KHIB	CHISHOLM-HIBBING, HIBBING, MN.
KHIF	HILL AFB, OGDEN, UT.
KHKY	HICKORY REGIONAL, HICKORY, NC.
KHLN	HELENA REGIONAL, HELENA, MT.
KHLR	HOOD AAF, FT. HOOD/KILLEEN, TX.
KHMN	HOLLOMAN AFB, ALAMOGORDO, NM.
KHON	HURON REGIONAL, HURON, SD.
KHOP	CAMPBELL AAF, FORT CAMPBELL, KY.
KHOT	MEMORIAL FIELD, HOT SPRINGS, AR.
KHOU	WILLIAM P HOBBY, HOUSTON, TX.
KHPN	WESTCHESTER COUNTY, WHITE PLAINS, NY.
KHRL	RIO GRANDE VALLEY INTL, HARLINGEN, TX.
KHRO	BOONE COUNTY, HARRISON, AR.
KHST	HOMESTEAD AFB, HOMESTEAD, FL.
KHSV	HUNTSVILLE INTL-CARL T JONES FIELD, HUNTSVILLE, AL.
KHTS	TRI-STATE/MILTON J. FERGUSON FIELD, HUNTINGTON, WV.
KHUA	REDSTONE AAF, REDSTONE ARSENAL, HUNTSVILLE, AL.
KHUF	HULMAN REGIONAL, TERRE HAUTE, IN.
KHUT	HUTCHINSON MUNI, HUTCHINSON, KS.
KHVN	TWEED-NEW HAVEN, NEW HAVEN, CT.
KHYA	BARNSTABLE MUNI-BOARDMAN/POLANDO FIELD, HYANNIS, MA. I
KIAB	MC CONNELL AFB, WITCHITA, KS.
KIAD	WASHINGTON DULLES INTERNATIONAL, WASHINGTON, DC.
KIAG	NIAGARA FALLS INTL, NIAGARA FALLS, NY.
KIAH	HOUSTON INTERCONTINENTAL, HOUSTON, TX.
KICT	WICHITA MID-CONTINENT, WICHITA, KS.
KIDA	FANNING FIELD, IDAHO FALLS, ID.
KIKK	GREATER KANKAKEE, KANKAKEE, IL.
KIKR	KIRKLAND AFB, ALBUQUERQUE, NM.
KILG	NEW CASTLE COUNTY, WILMINGTON, DE.
KILM	NEW HANOVER INTERNATIONAL, WILMINGTON, NC.
KIND	INDIANAPOLIS INTL, INDIANAPOLIS, IN.
KINK	WINKLER COUNTY, WINK, TX.
KINL	FALLS INTL, INTERNATIONAL FALLS, NM.
KINT	SMITH REYNOLDS, WINSTON SALEM, NC.
KIPT	WILLIAMSPORT-LYCOMING COUNTY, WILLIAMSPORT, PA.
KIRK	KIRKSVILLE REGIONAL, KIRKSVILLE, MO.
KISP	LONG ISLAND MAC ARTHUR, ISLIP, NY.
KIWA	WILLIAMS AFB, CHANDLER, AZ. J
KJAC	JACKSON HOLE, JACKSON HOLE, WY.
KJAN	JACKSON INTERNATIONAL, JACKSON, MS.
KJAX	JACKSONVILLE INTL, FL.
KJBR	JONESBORO MUNI, JONESBORO, AR.
KJFK	JOHN F KENNEDY INTL, NEW YORK, NY.
KJLN	JOPLIN REGIONAL, JOPLIN, MO.
KJMS	JAMESTOWN MUNI, JAMESTOWN, NY.
KJST	JOHNSTOWN-CAMBRIA COUNTY, JOHNSTOWN, PA.
KJXN	JACKSON COUNTY/REYNOLDS FIELD, JACKSON, MI.L
KLAF	PURDUE UNIVERSITY, LAFAYETTE, IN.
KLAL	LAKELAND LINDER REGIONAL, LAKELAND, FL.

KLAN CAPITAL CITY, LANSING, MI.
KLAR GENERAL BREES FIELD, LARAMIE, WY.
KLAS MC CARRAN INTL, LAS VEGAS, NM.
KLAX LOS ANGELES INTL, CA.
KLBB LUBBOCK INTL, LUBBOCK, TX.
KLBE WESTMORELAND COUNTY, LATROBE, PA.
KLBF NORTH PLATTE REGIONAL, NORTH PLATTE, NE.
KLBL LIBERAL MUNI, LIBERAL, KS.
KLCH LAKE CHARLES REGIONAL, LAKE CHARLES, LA.
KLCK RICKENBACKER, COLUMBUS, OH.
KLEB LEBANON MUNI, LEBANON, NH.
KLEX BLUE GRASS, LEXINGTON, KY.
KLFI LANGLEY AFB, HAMPTON, VA.
KLFT LAFAYETTE REGIONAL, LAFAYETTE, LA.
KLGA LA GUARDIA, NEW YORK, NY.
KLGB LONG BEACH /DAUGHERTY FIELD/, LONG BEACH, CA.
KLIT ADAMS FIELD, LITTLE ROCK, AR.
KLIZ LORING AFB, LIMESTONE, ME.
KLMT KLAMATH FALLS INTERNATIONAL, OR.
KLNK LINCOLN MUNI, LINCOLN, NE.
KLNS LANCASTER, LANCASTER, PA.
KLOU BOWMAN FIELD, LOUISVILLE, KY.
KLOZ LONDON-CORBIN-MAGEE FIELD, LONDON, KY.
KLRD LAREDO INTL, LAREDO, TX.
KLRF LITTLE ROCK AFB, LITTLE ROCK , AR.
KLRU LAS CRUCES INTERNATIONAL, LAS CRUCES, NM.
KLSE LA CROSSE MUNI, LA CROSSE, WI.
KLSF LAWSON AAF, FORT BENNING, GA
KLSV NELLIS AFB, LAS VEGAS, NV.
KLTS ALTUS AFB, ALTUS, OK.
KLUF LUKE AFB, GLENDALE, AZ.
KLVM MISSION FIELD, LIVINGSTON, MT.
KLWT LEWISTOWN MUNI, LEWLISTOWN, MT.
KLUK CINCINNATI MUNI AIRPORT LUNKEN FIELD, CINCINNATI, OH.
KLYH LYNCHBURG REGIONAL/PRESTON GLENN FIELD, LYNCHBURG, VA. M
KMAF MIDLAND INTERNATIONAL, MIDLAND, TX.
KMBS TRI CITY INTERNATIONAL, SAGINAW, MI.
KMCB PIKE COUNTY/JOHN E. LEWIS FIELD. MC COMB, MS,
KMCC MC CLELLAN AFB, SACRAMENTO, CA.
KMCF MAC DILL AFB, TAMPA, FL.
KMCI KANSAS CITY INTL, KANSAS CITY MO.
KMCN MIDDLE GEORGIA REGIONAL, MACON, CA.
KMCO ORLANDO INTL, ORLANDO, FL.
KMDH SOUTHERN ILLINOIS, CARBONDALE/ MURPHYSBORO, IL.
KMDT HARRISBURG INTERNATIONAL, HARRISBURG, PA.
KMDW CHICAGO MIDWAY, CHICAGO, IL.
KMEI KEY FIELD, MERIDIAN, MS.
KMEM MEMPHIS INTL, MEMPHIS, TN.
KMER CASTLE AFB, MERCED, CA.
KMFD MANSFIELD LAHM MUNI, MANSFIELD, OH.
KMFE MILLER INTL, MC ALLEN, TX.
KMFR MEDFORD-JACKSON COUNTY, MEDFORD, OR.
KMGE DOBBINS AFB, MARIETTQ, GA.
KMGM DANNELLY FIELD, MONTGOMERY, AL.
KMGW MORGANTOWN MUNI-WALTER L. BILL HART FLD, MORGANTOWN, WV.
KMHK MANHATTAN MUNI, MANHATTAN, KS.
KMHR MATHER AFB, SACRAMENTO, CA.
KMHT MANCHESTER, MANCHESTER, NH.
KMIA MIAMI INTL, MIAMI, FL.
KMIB MINOT AFB, MINOT, ND.
KMIE DELAWARE COUNTY-JOHNSON FIELD, MUNCIE, IN.
KMIV MILLVILLE MUNI, MILLVILLE, NJ.
KMKC KANSAS CITY DOWNTOWN, KANSAS CITY, MO.
KMKE GENERAL MITCHELL INTERNATIONAL, MILWAUKEE, WI.
KMKG MUSKEGON COUNTY, MUSKEGON, MI.
KMKL MC KELLAR-SIPES REGIONAL, JACKSON, TN.
KMLB MELBOURNE REGIONAL, MELBOURNE, FL.
KMLC MC ALESTER REGIONAL, MC ALESTER, OK.
KMLI QUAD-CITY, MOLINE, IL.
KMLS FRANK WILEY FIELD, MILES CITY, MT.
KMLU MONROE REGIONAL, MONROE, LA.
KMMU MORRISTOWN MUNI, MORRISTOWN, NJ.
KMMV MC MINNVILLE MUNI, MC MINNVILLE, OR.
KMOB MOBILE REGIONAL, MOBILE, AL.
KMOD MODESTO CITY-COUNTY--HARRY SHAM FIELD, MODESTO, CA.
KMOT MINOT INTL, MINOT, ND.
KMQT MARQUETTE COUNTY, MARQUETTE, MI.
KMQY SMYRNA APRT, SMYRNA, TN.
KMRB EASTERN WV. REGIONAL/SHEPHERD FIELD, MARTINSBURG, WV.
KMRY MONTEREY PENINSULA, MONTEREY, CA.
KMSL MUSCLE SHOALS REGIONAL, MUSCLE SHOALS, MS.
KMSN DANE COUNTY REGIONAL-TRUAX FIELD, MADISON, WI.
KMSO MISSOULA INTERNATIONAL, MISSOULA, MT.
KMSP MINNEAPOLIS-ST PAUL INTL/WOLD-CHAMBERLAIN, MINNEAPOLIS, MN.
KMSS MASSENA INTL-RICHARDS FIELD, MASSENA, NY.
KMSY NEW ORLEANS INTL/MOISANT FLD/, NEW ORLEANS, LA.
KMTC SELFRIDGE ANGB APRT, MT. CLEMENS, MI.
KMUI MUIR AAF, FT. INDIANTOWN GAP, PA.
KMUO MOUNTAIN HOME AFB, MOUNTAIN HOME, ID.
KMTN MARTIN STATE, BALTIMORE, MD.
KMXF MAXWELL AFB. MONTGOMERY, AL.
KMYR MYRTLE BEACH AFB, MYRTLE BEACH, SC.
KMYV YUBA COUNTY APRT, MARYSVILLE, CA.N
KNBC BEAUFORT MCAS /MERRITT FIELD/, BEAUFORT, SC.
KNBE DALLAS NAS /HENSLEY FIELD/, DALLAS, TX.
KNBG NEW ORLEANS NAS, NEW ORLEANS, LA.
KNBU GLENVIEW NAS, GLENVIEW, IL.
KNCA NEW RIVER MCAS, JACKSONVILLE, NC.

KNEL	LAKEHURST NAWC /MAXFIELD FIELD/, LAKEHURST, NJ.
KNEW	LAKEFRONT, NEW ORLEANS, LA.
KNFG	CAMP PENDELTON MCAS, OCEANSIDE, CA.
KNFL	FALLON NAS, FALLON, NV.
KNGP	CORPUS CHRISTI NAS, CORBUS CHRISTI, TX.
KNGU	NORFOLK NAS /CHAMBERS FIELD/, NORFOLK, VA.
KNGZ	ALAMEDA NAS /NIMITZ FIELD/, ALAMEDA, CA.
KNHK	PATUXENT RIVER NAS, PATUXENT RIVER, MD
KNHZ	BRUNSWICK NAS, BRUNSWICK, ME.
KNIP	JACKSONVILLE NAS, JACKSONVILLE, FL.
KNIR	CHASE FIELD NAS, BEEVILLE, TX.
KNJK	EL CENTRO NAS, EL CENTRO, CA.
KNJP	WARMINSTER NADC APRT, WARMINSTER, PA.
KNKT	CHERRY POINT MCAS /CUNNINGHAM FIELD/, CHERRY POINT, NC.
KNKX	MIRAMAR NAS, SAN DIEGO, CA.
KNMM	MERIDAN NAS, MERIDAN, MS.
KNPA	PENSACOLA NAS, PENSACOLA, FL.
KNQI	KINGSVILLE NAS, KINGSVILLE, TX.
KNQX	KEY WEST NAS, KEY WEST, FL.
KNTK	TUSTIN MCAS, TUSTIN, CA.
KNTD	POINT MUGU NAWS, POINT MUGU, CA.
KNTU	OCEANA NAS /APOLLO SOUCEK FIELD/, VIRGINIA BEACH, VA.
KNUQ	MOFFETT NAS, MOUNTAIN VIEW, CA.
KNXX	WILLOW GROVE NAS, WILLOW GROVE, PA.
KNZC	CECIL FIELD NAS, JACKSONVILLE, FL.
KNZJ	EL TORO MCAS. SANTA ANA, CA.
KNZW	SOUTH WEYMOUTH NAS/SHEA FIELD, SOUTH WEYMOUTH, MA.
KNZY	NORTH ISLAND NAS /HALSEY FIELD/, SAN DIEGO, CA. O
KOAK	METROPOLITAN OAKLAND INTL, OAKLAND, CA.
KOAR	FRITZSCHE AAF, FORT ORD/MONTEREY, CA.
KOEX	FAA AERONAUTICAL CENTER, OKLAHOMA CITY, OK.
KOFF	PFFITT AFB. OMAHA, NE.
KOGD	OGDEN-HINCKLEY, OGDEN, UT.
KOKC	WILL ROGERS WORLD, OKLAHOMA CITY, OK.
KOLU	COLUMBUS MUNI, COLUMBUS, NE.
KOMA	EPPLEY AIRFIELD, OMAHA, NE.
KONT	ONTARIO INTL, ONTARIO, CA.
KORD	CHICAGO O'HARE INTL, CHICAGO, IL.
KORF	NORFOLK INTL, NORFOLK, VA.
KORH	WORCESTER MUNI, WORCESTER, MA.
KOSC	WURTSMITH AFB. OSCODA, MI.
KOSH	WITTMAN REGIONAL, OSHKOSH, WI.
KOSU	OHIO STATE UNIVERSITY, COLUMBUS, OH.
KOTH	NORTH BEND MUNI, NORTH BEND, OR.
KOTM	OTTUMWA INDUSTRIAL, OTTUMWA IA.
KOWB	OWENSBORO-DAVIESS COUNTY, OWENSBORO, KY.
KOZR	CAIRNS AAF, FORT RUCKER/OZARK, AL.P
KPAE	SNOHOMISH COUNTY (PAINE FLD), EVERETT, WA.
KPAH	BARKLEY REGIONAL, PADUCAH, KY.
KPAM	TYNDALL AFB, PANAMA CITY, FL.
KPBG	PLATTSBURGH AFB. PLATTSBURGH, NY.
KPBI	PALM BEACH INTL, PALM BEACH, FL.
KPDK	DE KALB-PEACHTREE, ATLANTA, GA.
KPDX	PORTLAND INTL, PORTLAND, OR.
KPFN	PANAMA CITY-BAY COUNTY, PANAMA CITY, FL.
KPHF	NEWPORT NEWS/WILLIAMSBURG INTERNATIONAL, NEWPORT NEWS, VA.
KPHL	PHILADELPHIA INTL, PHILADELPHIA, PA.
KPHX	PHOENIX SKY HARBOR INTL, PHOENIX, AZ.
KPIA	GREATER PEORIA REGIONAL, PEORIA, IL.
KPIB	HATTIESBURG-LAUREL REGIONAL, HATTIESBURG, MS.
KPIE	ST PETERSBURG/CLEARWATER INTL, ST.PETERSBURG, FL.
KPIH	POCATELLO REGIONAL, PACATELLO, ID.
KPIR	PIERRE MUNI, PIERRE, SD.
KPIT	GREATER PITTSBURGH INTL, PITTSBURGH, PA.
KPKB	WOOD COUNTY/GIL ROBB WILSON APRT, PARKERSBURG, WV.
KPLB	CLINTON CO, PLATTSBURGH, NY.
KPLN	PELLSTON REGIONAL AIRPORT OF EMMET COUNTY, PELLSTON, MI.
KPMD	PALMDALE PRODN FLT/TEST INSTLN AF PLANT 42, PALMDALE, CA.
KPNM	PRINCETON MUNI, PRINCETON, MN.
KPNS	PENSACOLA REGIONAL, PENSACOLA, FL.
KPOB	POPE AFB, FAYETTEVILLE, NC.
KPOE	POLK AAF, FORT POLK, LA.
KPOU	DUTCHESS COUNTY, POUGHKEEPSIE, NY.
KPQI	NORTHERN MAINE REGIONAL ARPT AT PRESQUE IS, PRESQUE IS, ME.
KPRB	PASO ROBLES MUNI, PASO ROBLES, CA.
KPRC	ERNEST A.LOVE FIELD, PRESCOTT, AZ.
KPRX	COX FLD, PARIS, TX.
KPSM	PEASE INTERNATIONAL TRADEPORT, PORTSMOUTH, NH.
KPSP	PALM SPRINGS REGIONAL, PALM SPRINGS, CA.
KPTK	OAKLAND-PONTIAC, PONTIAC, MI.
KPUB	PUEBLO MEMORIAL, PUEBLO, CO.
KPVD	THEODORE FRANCIS GREEN STATE, PROVIDENCE, RI.
KPWM	PORTLAND INTL JETPORT, PORTLAND, ME.
KPWT	BREMERTON NATIONAL, BREMERTON, WA.R
KRAN	FAA ALASKAN REGIONAL OFFICE MESSAGE CENTER, ANCHORAGE, AK.
KRAL	RIVERSIDE MUNI, RIVERSIDE, CA.
KRAP	RAPID CITY REGIONAL, RAPID CITY, SD.
KRBL	RED BLUFF MUNI, RED BLUFF, CA.
KRBM	ROBINSON AAF, LITTLE ROCK, AR.
KRBN	FAA NEW ENGLAND REGIONAL OFFICE MESSAGE CENTER, BOSTON, MA.
KRCA	ELLSWORTH AFB, RAPID CITY, SD.
KRCC	USAF RESCUE COORDINATION CENTER, BELLEVILLE, IL.
KRDD	REDDING MUNI, REDDING, CA.

KRDG READING REGIONAL/CARL A SPAATZ FIELD, READING, PA.
KRDM ROBERTS FIELD, REDMOND, OR.
KRDU RALEIGH-DURHAM INTERNATIONAL, RALEIGH/DURHAM, NC.
KREE REESE AFB, LUBBOCK, TX.
KRFD GREATER ROCKFORD, ROCKFORD, IL.
KRFW FAA SOUTHWEST REGIONAL OFFICE MESSAGE CENTER, FORT WORTH, TX.
KRGC FAA GREAT LAKES REGIONAL OFFICE MESSAGE CENTER, CHICAGO, IL.
KRHI RHINELANDER-ONEIDA COUNTY, RHINELANDER, WI.
KRIC RICHMOND INTL (BYRD FIELD), RICHMOND, VA.
KRIU RANCHO MURIETA, RANCHO MURIETA, CA.
KRIV MARCH AFB, RIVERSIDE, CA.
KRKC FAA CENTRAL REGIONAL OFFICE MESSAGE CENTER, KANSAS CITY, MO.
KRKS ROCKSPRINGS-SWEETWATER COUNTY, ROCKSPRINGS, WY.
KRLA FAA WESTERN/PACIFIC REGIONAL OFFICE MESSAGE CENTER, LOS ANGELES, CA.
KRME GRIFFISS AFB, ROME, NY.
KRMG RICHARD B RUSSELL, ROME, GA.
KRND RANDOLPH AFB, UNIVERSAL CITY, TX.
KRNO RENO CANNON INTL, RENO, NV.
KRNY FAA EASTERN REGIONAL OFFICE MESSAGE CENTER, NEW YORK, NY.
KROA ROANOKE REGIONAL/WOODRUM FIELD, ROANOKE, VA.
KROC GREATER ROCHESTER INTERNATIONAL, ROCHESTER, NY.
KROW ROSWELL INDUSTRIAL AIR CENTER, ROSWELL, NM.
KRSE FAA NORTHWEST MOUNTAIN REGIONAL OFFICE MESSAGE CENTER, SEATTLE, WA.
KRST ROCHESTER MUNI, ROCHESTER, MN.
KRSW SOUTHWEST FLORIDA REGIONAL, FORT MEYERS, FL.
KRTL FAA SOUTHERN REGIONAL OFFICE MESSAGE CENTER, ATLANTA, GA.
KRUT RUTLAND STATE, RUTLAND, VT.
KRWA FAA HEADQUARTERS MESSAGE CENTER, WASHINGTON, DC.
KRWI ROCKY MOUNT-WILSON, ROCKY-MOUNT, NC. S
KSAC SACRAMENTO EXECUTIVE, SACRAMENTO, CA.
KSAN SAN DIEGO INTL-LINDBERGH FLD, SAN DIEGO, CA.
KSAT SAN ANTONIO INTL, SAN ANTONIO, TX.
KSAV SAVANNAH INTERNATIONAL, SAVANNAH, GA.
KSAW K.I.SAWYER AFB, GWINN, MI.
KSBA SANTA BARBARA MUNI, SANTA BARBARA, CA.
KSBD NORTON AFB, SAN BERNARDINO, CA.
KSBN MICHIANA REGIONAL, SOUTH BEND, IN.
KSBP SAN LUIS OBISPO COUNTY-MC CHESNEY FIELD, SAN LUIS OBISPO, CA.
KSBS STEAMBOAT SPRINGS/BOB ADAMS FIELD, STEAMBOAT SPRINGS, CO.
KSBY SALISBURY-WICOMICO COUNTY REGIONAL, SALISBURY, MD.
KSCK STOCKTON METROPOLITAN, STOCKTON, CA.
KSDF STANDIFORD FIELD, LOUISVILLE, KY.
KSEA SEATTLE-TACOMA INTL, SEATTLE, WA.
KSFB CENTRAL FLORIDA REGIONAL, ORLANDO, FL.
KSFF FELTS FIELD, SPOKANE, WA.
KSFO SAN FRANCISCO INTL, SAN FRANCISCO, CA.
KSGF SPRINGFIELD REGIONAL, SPRINGFIELD,MO.
KSGH SPRINGFIELD-BECKLEY MUNI, SPRINGFIELD, OH.
KSHR SHERIDAN COUNTY, SHERIDAN, WY.
KSHV SHREVEPORT REGIONAL, SHREVEPORT, LA.
KSJC SAN JOSE INTERNATIONAL, SAN JOSE, CA.
KSJT MATHIS FIELD, SAN ANGELO, TX.
KSKA FAIRCHILD AFB, SPOKANE, WA.
KSKF KELLY AFB, SAN ANTONIO, TX.
KSLC SALT LAKE CITY INTL, SALT LAKE CITY, UT.
KSLE MCNARY FLD, SALEM, OR.
KSLI LOS ALAMITOS AAF, LOS ALAMITOS, CA.
KSLK ADIRONDACK, SARANAC LAKE, NY.
KSLN SALINA MUNI, SALINA, CA.
KSMF SACRAMENTO METROPOLITAN, SACRAMENTO, CA.
KSMX SANTA MARIA PUBLIC, SANTA MARIA, CA.
KSNA JOHN WAYNE AIRPORT-ORANGE COUNTY, SANTA ANA, CA.
KSNS SALINAS MUNI, SALINAS, CA.
KSPA SPARTANBURG DOWNTOWN MEMORIAL, SPARTANBURG, SC.
KSPI CAPITAL, SPRINGFIELD, IL.
KSPS SHEPPARD AFB/WICHITA FALLS MUNI, WICHITA FALLS, TX.
KSRQ SARASOTA-BRADENTON, SARASOTA, FL.
KSRR SIERRA BLANCA REGIONAL, RUIDOSO, NM.
KSSC SHAW AFB, SUMTER, SC.
KSTC ST CLOUD MUNI, ST. CLOUD, MN.
KSTJ ROSECRANS MEMORIAL, ST. JOSEPH, MO.
KSTL LAMBERT-ST LOUIS INTL, ST LOUIS, MO.
KSTP ST. PAUL DOWNTOWN HOLMAN FLD, ST PAUL, MN.
KSUS SPIRIT OF ST LOUIS, ST LOUIS, MO.
KSUU TRAVIS AFB, FAIRFIELD, CA.
KSUX SIOUX GATEWAY, SIOUX CITY, IA.
KSVN HUNTER AAF, SAVANNAH, GA.
KSWF STEWART INT'L, NEWBURG, NY.
KSWO STILLWATER MUNI, STILLWATER, OK.
KSYR SYRACUSE HANCOCK INTL, SYRACUSE, NY.
KSZL WHITEMAN AFB, KNOB NOSTER, MO.T
KTBN FORNEY AAF, FORT LEONARD WOOD, MO.
KTCC TUCUMCARI MUNI, TUCUMCARI, NM.
KTCL TUSCALOOSA MUNI, TUSCALOOSA, AL.
KTCM MCCHORD AFB, TACOMA, WA.
KTCS TRUTH OR CONSEQUENCES MUNI, TRUTH OR CONSEQUENCES, NM.
KTEB TETERBORO, TETERBORO, NJ.
KTIK TINKER AFB, OKLAHOMA CITY, OK.

KTIX	SPACE CENTER EXECUTIVE, TITUSVILLE, FL.
KTLH	TALLAHASSEE REGIONAL, TALLAHASSEE, FL.
KTOL	TOLEDO EXPRESS, TOLEDO, OH.
KTPA	TAMPA INTL, TAMPA, FL.
KTPL	DRAUGHON-MILLER MUNI, TEMPLE, TX.
KTRI	TRI-CITY REGIONAL, BRISTOL/KINGSPORT/ JOHNSON CITY, TN.
KTTN	MERCER COUNTY, TRENTON, NJ.
KTUL	TULSA INTL, TULSA, OK.
KTUP	TUPELO MUNICIPAL - C D LEMONS, TUPELO, MS.
KTUS	TUCSON INTL, TUSCON, AZ.
KTVC	CHERRY CAPITAL, TREVERSE CITY, MI.
KTVL	LAKE TAHOE, SOUTH LAKE TAHOE, CA.
KTWF	TWIN FALLS-SUN VALLEY REGIONAL JOSLIN FLD, TWIN FALLS, ID.
KTXK	TEXARKANA REGIONAL-WEBB FIELD, TEXARKANA, TX.
KTYR	TYLER POUNDS FIELD, TYLER, TX.
KTYS	MC GHEE TYSON, KNOXVILLE, TN.U
UCA	ONEIDA COUNTY, UTICA, NY.
KUIN	QUINCY MUNI BALDWIN FIELD, QUINCY, IL.
KUKI	UKIAH MUNI, UKIAH, CA.
KUOX	UNIVERSITY-OXFORD, OXFORD, MS.V
KVAD	MOODY AFB, VALDOSTA, GA.
KVBG	VANDENBURG AFB, LOMPOC, CA.
KVCT	VICTORIA REGIONAL, VICTORIA, TX.
KVCV	GEORGE AFB, VICTORVILLE, CA.
KVLD	VALDOSTA REGIONAL, VALDOSTA, GA.
KVOK	VOLK AAF, CAMP DOUGLAS, WI.
KVPS	EGLIN AFB, VALPARAISO, FL.
KVPZ	PORTER COUNTY MUNI, VALPARAISO, IN.
KVRB	VERO BEACH MUNI, VERO BEACH, FL. W
KWBC	NWS NATIONAL METEOROLOGICAL CENTER, WASHINGTON, DC.
KWRB	ROBINS AFB, WARNER ROBINS, GA.
KWRI	MC GUIRE AFB, WRIGHTSTOWN, NJ.
KWRL	WORLAND MUNI, WORLAND, WY.
KWWD	CAPE MAY COUNTY, WILDWOOD, NJ.
KWYS	YELLOWSTONE, WEST YELLOWSTONE, WY.X
KXMR	CAPE CANAVERAL AFS SKID STRIP, COCOA BEACH FL. Y
KYIP	WILLOW RUN, DETROIT, MI.
KYKM	YAKIMA AIR TERMINAL, YAKIMA, WA.
KYKN	CHAN GURNEY MUNI, YANGTON, SD.
KYNG	YOUNGSTOWN MUNI, YOUNGSTOWN, OH.
KYUM	YUMA MCAS/YUMA INTL, YUMA, AZ. Z
KZAB	ALBUQUERQUE ARTCC, ALBUQUERQUE, NM.
KZAK	OAKLAND ODAPS, OAKLAND,CA.
KZAS	SALT LAKE CITY AWP, SALT LAKE CITY, UT.
KZAU	CHICAGO ARTCC, CHICAGO, IL.
KZBW	BOSTON ARTCC, NASHUA, NH.
KZDC	WASHINGTON ARTCC, WASHINGTON, DC.
KZDV	DENVER ARTCC, DENVER, CO.
KZFW	FORT WORTH ARTCC, FORT WORTH, TX.
KZHU	HOUSTON ARTCC, HOUSTON, TX.
KZID	INDIANAPOLIS, ARTCC, INDIANAPOLIS, IN.
KZJX	JACKSONVILLE ARTCC, JACKSONVILLE, FL.
KZKC	KANSAS CITY ARTCC, OLATHE, KS.
KZLA	LOS ANGELES ARTCC, PALMDALE, CA.
KZLC	SALT LAKE CITY ARTCC, SALT LAKE CITY, UT.
KZMA	MIAMI ARTCC, MIAMI, FL.
KZME	MEMPHIS ARTCC, MEMPHIS, TN.
KZMP	MINNEAPOLIS ARTCC, FARMINGTON, MN.
KZNY	NEW YORK ARTCC, RONKONKOMA, NY.
KZOA	OAKLAND ARTCC, FREMONT, CA.
KZOB	CLEVELAND ARTCC, OBERLIN, OH.
KZSE	SEATTLE ARTCC, AUBURN, WA.
KZTL	ATLANTA ARTCC, HAMPTON, GA.
KZWT	ATLANTA AWP, ATLANTA, GA.
KZWY	NEW YORK (ARTCC-OCEANIC/ODAPS), RONKONKOMA, NY.
KZZV	ZANESVILLE, ZANESVILLE, OH.

VIRGIN ISLANDS (U.S.)

TIST*	St. Thomas/Harry S. Truman
TISX*	St. Croix/Alexander Hamilton

PUERTO RICO

TJBQ*	Aguadilla/Borinquen
TJCG*	Vieques/Camp Garzia Airstrip
TJCP*	Culebra
TJFA*	Fajardo
TJFF*	Ramey (USAF Solar Flare Forecast Facility)
TJIG*	San Juan/Isla Grande
TJMZ*	Mayaguez
TJNR	Roosevelt Roads NAS
TJPS*	Ponce/Mercedita
TJSJ	San Juan/Puerto Rico Intl
TJVQ*	Vieques
TJZS	San Juan ATCC

AMERICAN SAMOA

NSTU	Pago Pago/Pago Pago Intl Tutuila Island

ALASKA

PAAQ	Palmer
PABA	Barter Island
PABE	Bethel
PABG	Big Delta (Army Arctic Cold Weather Test Center)
PABI	Delta Junction/Allen AAF
PABM	Big Mountain (AFS)
PABR	Barrow
PABT	Bettles
PACD	Cold Bay
PACL	Clear (MEWS)
PACS	Cape Sarichef (AFS)
PACV	Cordova
PACZ	Cape Romanzof (AFS)
PADF	Driftwood Bay (AFS)
PADK	Adak/Davis
PADL	Dillingham
PADQ	Kodiak
PADU	Dutch Harbour

PAEH	Cape Newenham (AFS)
PAEI	Fairbanks/Eielson AFB
PAED	Anchorage/Elmendorf AFB
PAEN	Kenai
PAFA	Fairbanks/Fairbanks Intl
PAFB	Fairbanks/Wainwright AAF
PAFR	Fort Richardson/Bryant AAF
PAFW	Farewell
PAGA	Galena
PAGK	Gulkana
PAHO	Homer
PAIL	Iliamna
PAIM	Indian Mountain (AFS)
PAJN	Juneau
PAKN	King Salmon
PAKT	Ketchikan
PALU	Cape Lisburne (AFS)
PAMC	McGrath
PAMR	Anchorage/Merril Field
PANC	Anchorage/Anchorage Intl
PANT	Annette Island
PAOM	Nome
PAOR	Northway
PAOT	Kotzebue
PAPB	Point Barrow
PAPM	Port Moller (AFS)
PASC	Deadhorse
PASI	Sitka
PASN	St. Paul Island
PASV	Sparrevohn (AFS)
PASY	Shemya/Shemya
PATA	Tanana
PATC	Tin City (AFS)
PATK	Talkeetna
PATL	Tatalina (AFS)
PAUN	Unalakleet
PAVD	Valdez
PAWD	Kodiak/Municipal
PAWT	Wainwright (DEW STN)
PAWW	Wildwood
PAYA	Yakutat
PAZA	Anchorage ATCC
PAZF	Fairbanks ATCC

BAKER I.

PBAR	Baker I. Army Air Field

MARIANA IS.

PGAC	Guam/Taguac
PGFW	Guam (Fleet Weather Central)
PGRO	Rota
PGSN	Siapan I. (Obyan) Intl
PGTW	Guam (Joint Tyhoon Warning Center)
PGUA	Guam/Andersen AFB
PGUM	Guam/Agana NAS

HAWAII

PHBK	Barking Sands, Kauai
PHDH	Oahu/Dillingham AFB
PHFF	Oahu (USAF Solar Flare Forecast Facility)
PHHI	Oahu/Wheeler AFB
PHHN	Hana, Maui
PHIK	Honolulu/Hickham AFB, Oahu
PHKO	Kona/Ke-ahole
PHKP	Kaanapali, Maui
PHKU	Kunia
PHLI	Lihue, Kauai
PHMK	Molokai
PHMU	Waimea-Kohala, Kamuela, Hawaii I.
PHNA	Barbers Point/Barbers Point NAS, Oahu
PHNC	Pearl Harbor (Navy Communications Center)
PHNG	Kaneohe, Oahu
PHNL	Honolulu/Honolulu Intl, Oahu
PHNY	Lanai City, Lanai
PHOG	Kahului, Maui
PHSF	Bradshaw Field, Hawaii I.
PHTO	Hilo/General Lyman Field, Hawaii I.
PHZH	Honolulu ATCC

JOHNSTON I.

PJON	Johnston Island/Johnston Atoll

MARSHALL IS.

PKMA	Eniwetok
PKMJ	Majuro
PKWA	Kwajalein

MIDWAY I.

PMDY	Midway Island/Sand Island Field

CAROLINE IS.

PTKK	Truk
PTPN	Ponape I.
PTRO	Koror
PTSA	Kusaie
PTTK	Kosrae
PTYA	Yap

WAKE I.

PWAK	Wake

U.S. AERONAUTICAL TELECOMMUNICATIONS SERVICES

(Services Available for Aircraft Engaged in International or Overseas Flight)

The aeronautical voice communication stations listed are available to and utilized by the U.S. Federal Aviation Administration Air Traffic Control Centers for air traffic control purposes.

The frequencies in use will depend upon the time of day or night and conditions which affect radio wave propagation. Voice communications handled on a single channel simplex basis (i.e., with the aircraft and the ground station using the same frequency for transmission and reception) unless otherwise noted in remarks.

The stations will remain on continuous watch for aircraft within their communications areas and, when practicable will transfer this watch to another station when the aircraft reaches the limit of the communications area.

Stations listed below which are designated "FAA" are operated by the U.S. Federal Aviation Administration. Stations designated "ARINC" are operated by Aeronautical Radio, Incorporated, 2551 Riva Road, Annapolis, Md. 21401, telephone number 301-266-4000; cable address ARINC Annapolis, Md.

STATION AND OPERATING AGENCY	RADIO CALL	TRANSMITTING FREQUENCIES	REMARKS
HONOLULU (ARINC)	Honolulu	2998 4666 6532 8903 11384 13300 17904 kHz	Central West Pacific Network
		3467 5643 8867 13261 17904 kHz	South Pacific Network
		3413 5574 8843 13354 17904 kHz	Central East Pacific One Network
		5547 11282 13288 17904 kHz	Central East Pacific Two Network
		2932 5628 6655 8951 10048 11330 13273 17904 kHz	North Pacific Network
		3013 6640 11342 13348 17925 21964	Long-Distance Operations Control (LDOC) Service (phone patch). Communications are limited to operational control matters only. Public correspondence (personal messages) to/from crew or passengers can not be accepted.
		131.95 mHz	Extended range VHF. Coverage area includes tracks to mainland extending outward from HNL to approximately 400 NM. Range on other tracks is approximately 300 NM.
HONOLULU (FAA)	Honolulu Radio	122.6 122.2 #121.5 mHz	#Emergency. Frequency 122.1 also available for receiving only.
	Volmet	2863 6679 8828 13282 kHz	Broadcast at H+200-05 and H+230-35; Aerodrome Forecasts, HONOLULU, HILO, GUAM. SIGMET. Hourly Report, Honolulu, Hilo, Kahului, Guam.
			Broadcasts at H+05-10 and H+35-40; Hourly Reports, San Francisco, Los Angeles, Seattle, Portland, Sacramento, Ontario, Las Vegas. SIGEMT. Aerodrome forecasts, SAN FRANCISCO, SEATTLE, LOS ANGELES.
			Broadcasts at H+25-30 and H+55-00; Hourly Reports, Anchorage, Elmendorf, Fairbanks, Cold Bay, King Salmon, Vancouver. SIGMET. Aerodrome Forecasts, ANCHORAGE, FAIRBANKS, COLD BAY, VANCOUVER.
MIAMI (FAA)	Miami Radio	126.7 118.9 126.9 122.2 123.65 122.75 mHz	Local and Short Range.
		#121.5 mHz	#Emergency.
NEW YORK (FAA)	New York Radio (Volmet)	3485 6604 10051 13270 kHz	Broadcasts at H+00-05; Aerodrome Forecasts, DETROIT, CHICAGO, CLEVELAND. Hourly Reports, Detroit, Chicago, Cleveland, Niagara Falls, Milwaukee, Indianapolis.

STATION AND OPERATING AGENCY	RADIO CALL	TRANSMITTING FREQUENCIES	REMARKS
			Broadcasts at H+05-10; SIGMET (Oceanic—New York). Aerodrome Forecasts, BANGOR, PITTSBURGH, CHARLOTTE. Hourly Reports, Bangor, Pittsburgh, Windsor Locks, St. Louis, Charlotte, Minneapolis.
			Broadcasts at H+10-15; Aerodrome Forecasts, NEW YORK, NEWARK, BOSTON. Hourly reports, New York, Newark, Boston, Baltimore, Philadelphia, Washington.
			Broadcasts at H+15-20; SIGMET (Oceanic—Miami/San Juan). Aerodrome Forecasts, BERMUDA, MIAMI, ATLANTA. Hourly Reports, Bermuda, Miami, Nassau, Freeport, Tampa, West Palm Beach, Atlanta.
			Broadcasts at H+30-35; Aerodrome Forecasts, NIAGARA FALLS, MILWAUKEE, INDIANAPOLIS. Hourly Reports, Detroit, Chicago, Cleveland, Niagara Falls, Milwaukee, Indianapolis.
			Broadcasts at H+35-40; SIGMET (Oceanic—New York). Aerodrome Forecasts, WINDSOR LOCKS, ST. LOUIS. Hourly Reports, Bangor, Pittsburgh, Windsor Locks, St. Louis, Charlotte, Minneapolis.
			Broadcasts at H+40-45; Aerodrome Forecasts, BALTIMORE, PHILADELPHIA, WASHINGTON. Hourly Reports, New York, Newark, Boston, Baltimore, Philadelphia, Washington.
			Broadcasts at H+45-50; SIGMET (Oceanic—Miami/San Juan). Aerodrome Forecasts, NASSAU, FREEPORT. Hourly Reports, Bermuda, Miami, Nassau, Freeport, Tampa, West Palm Beach, Atlanta.
▮ NEW YORK (ARINC)	New York	3016 5598 8906 13306 17946 kHz	North Atlantic Family A Network
		2962 6628 8825 11309 13354 17946 kHz	North Atlantic Family E Network
		2887 5550 6577 8918 11396 13297 17907 kHz	Caribbean Family A Network
		3455 5520 6586 8846 11330 17907 kHz	Caribbean Family B Network
		3494 6640 11342 13330 17925 21964 kHz	Long Distance Operations Control (LDOC) Service (phone-patch). Communications are limited to operational control matters only. Public coorespondence (personal messages) to/from crew or passengers can not be accepted.
		129.90 mHz	Extended range VHF. Coverage area includes Canadian Maritime Provinces, and oceanic routes to Bermuda and the Caribbean, from Boston, New York and Washington areas to approximately 36° N Lat.
SAN FRANCISCO (ARINC)	San Francisco	3413 5574 8843 10057 13354 17904 kHz	Central East Pacific One Network
		2869 5547 6673 11282 13288 17904 kHz	Central East Pacific Two Network
		3013 6640 11342 13348 17925 21964 kHz	Long-Distance Operations Control (LDOC) Service (phone patch). Communications are limited to operational control matters only. Public correspondence (personal messages) to/from crew or passengers can not be accepted.
		131.95 mHz	Extended range VHF. Coverage area includes tracks to HNL from SFO and LAX out to aprxly 128° W long.
		129.40 mHz	For en route communications for aircraft operating on Seattle/Anchorage/Routes/.

METEOROLOGY (MET)

Table of Contents

METEOROLOGICAL SERVICES

1. METEOROLOGICAL AUTHORITY

1.1 The meteorological services for civil aviation are prepared by the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

Postal Address:
National Weather Service
National Oceanic and Atmospheric Administration
Department of Commerce
8060 13th Street
Silver Spring, Maryland 20910
Telephone: 301-581-1818
Telex: None.
Commercial Telegraphic Address:
METEO WASHINGTON DC

2. APPLICABLE ICAO DOCUMENTS

2.1 ICAO Standards, Recommended Practices and Procedures Contained in the following documents are applied, with the exceptions (differences) noted below:

Annex 3, Meteorology
Doc 7030, Regional Supplementary Procedures (MET Procedures for CAR, NAT, PAC, and NAM)

2.2 Differences from ICAO Standards, Recommended Practices and Procedures. See AIP Section DIF.

3. CLIMATOLOGICAL SUMMARIES

3.1 Climatological summaries are available for the meteorological stations marked with an asterisk in MET-1.

3.2 Requests for copies of climatological summaries are made available through the:

National Climatic Data Center
Department of Commerce
National Oceanic and Atmospheric Administration
Environmental Data Services Branch
Federal Building
Asheville, North Carolina 28801

4. AREA OF RESPONSIBILITY

4.1 The National Weather Service is responsible for providing meteorological services for the 50 States of the U.S., its external territories, and possessions.

5. TYPES OF SERVICE PROVIDED

5.1 Area Forecast Charts (Facsimile Form)

5.1.1 The U.S. has one Area Forecast Center, the National Meteorological Center (NMC), located in Suitland, Maryland. The NMC prepares current weather, significant weather, forecast weather, constant pressure, and tropopause-vertical wind shear facsimile charts for the U.S., the Caribbean and Northern South America, the North Atlantic, and the North Pacific areas. The NMC does not prepare facsimile charts for Canada, with the exception of the preparation of a constant pressure and tropopause-vertical wind shear facsimile chart. Weather facsimile charts for Canada are prepared by the Atmospheric Environmental Service located in Montreal, Canada.

5.1.2 Facsimile weather charts are issued throughout the day on a regularly scheduled basis. The charts are transmitted via facsimile to all National Weather Service Offices and to FAA Flight Service Stations providing preflight information to Civil Aviation.

5.2 Local and Regional Aviation Forecasts (printed form)

5.2.1 Numerous forecasts and weather advisories are prepared which serve local and regional areas of the U.S. These forecasts are generally prepared by the National Weather Service on a scheduled basis or, as in the case of severe weather advisories, as needed. These forecasts are Area Forecast (FA), Aviation Terminal Forecast (FT), Severe Weather Forecast (WW), Hurricane Advisories (WT), Winds and Temperature Aloft Forecast (FD), Simplified Surface Analyses (AS), 12- and 24-Hour Prognoses (FS), and flight advisory notices, such as SIGMET's (WS), AIRMET's (WA), Center Weather Advisories (CWA), and Radar Weather Reports (SD).

5.3 Preflight Briefing Services

5.3.1 Preflight briefing services and flight documentation is provided through the preflight information offices operated by the National Weather Service or by the FAA Flight Service Station (FSS).

5.3.2 National Weather Service Preflight Briefing

5.3.2.1 It is the responsibility of the pilot-in-command to notify the National Weather Service preflight information office of his service needs. Details of the documents supplied to each flight are determined by consultation between the briefing officer and the pilot-in-command. In principle, this is determined by the type of aircraft along the following lines:

Piston	—500 and/or 700 mb. Prognostic —Significant Weather Prognostic (surface to 400 mb.) —Terminal Forecasts
Turbo-prop	—500, 300, and/or 250 mb. Prognostic —Significant Weather Prognostic (surface to 400 mb.)
Subsonic	—300, 200, and/or 250 mb. Prognostic jet —Tropopause-Vertical Wind Shear Prognostic —Significant Weather Prognostic (400 mb. to 150 or 70 mb.) —Terminal Forecasts
Long range	—Same as Subsonic Jet plus a 100 mb. Prognostic
Supersonic	—Same as Subsonic Jet plus a 100 mb. Prognostic

5.3.2.2 Aerodrome reports and other local meteorological data are presented in tabular form as indicated in MET 2 and MET 3 and as they are available.

5.4 National Weather Service Aviation Products

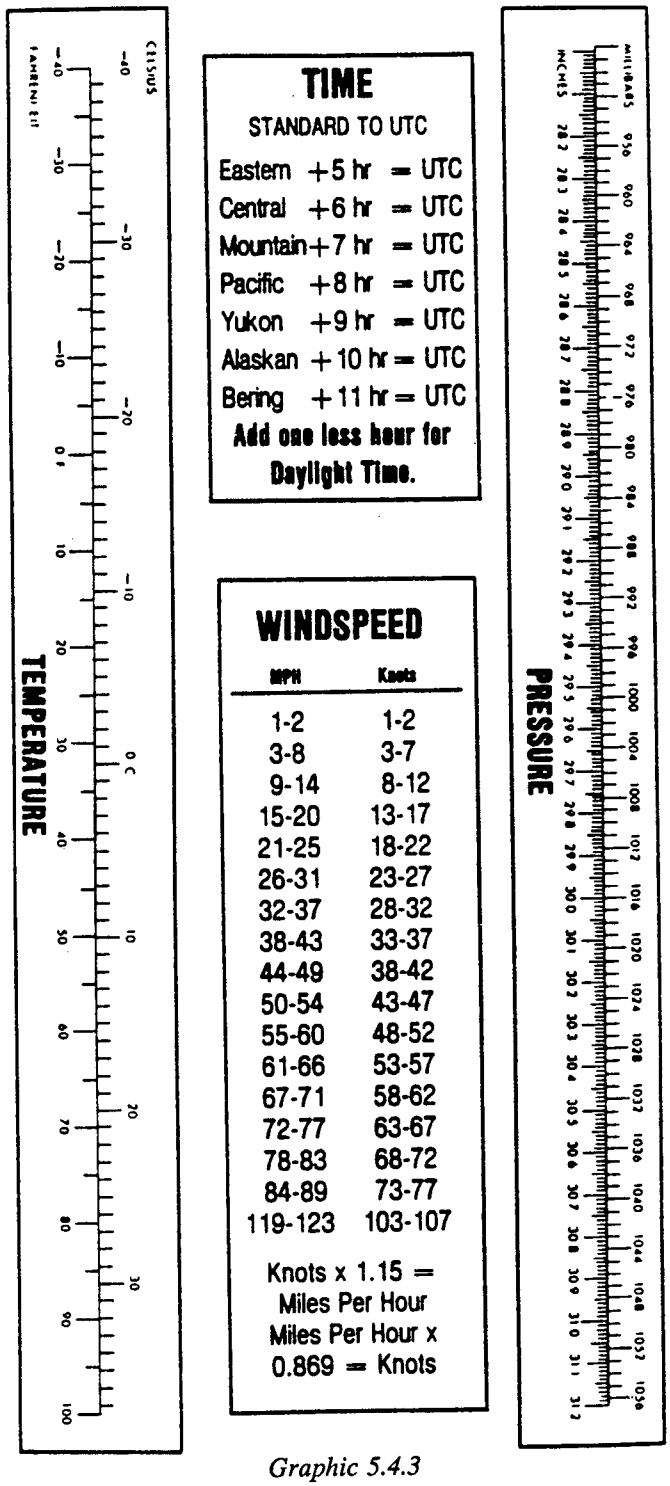
5.4.1 Weather service to aviation is a joint effort of the National Weather Service (NWS), the Federal Aviation Administration (FAA), the military weather services, and other aviation oriented groups and individuals. The NWS maintains an extensive surface, upper air, and radar weather observing program; a nationwide aviation weather forecasting service; and also provides pilot briefing service. The majority of pilot weather briefings are provided by FAA personnel at Flight Service Stations (FSS). Surface weather observations are taken by the NWS and NWS certified FAA, contract, and supplemental observers and by automated observing systems. (See paragraph MET-0;5.13).

5.4.2 Aviation forecasts are prepared by 52 Weather Service Forecast Offices (WSFO's). These offices prepare and distribute approximately 500 terminal forecasts 3 times daily for specific airports in the 50 States and the Caribbean (4 times daily in Alaska and Hawaii). These forecasts, which are amended as required, are valid for 24 hours. The last 6 hours are given in categorical outlook terms as described in paragraph 5.9. WSFO's also prepare a total of over 300 route forecasts and 39 synopses for Pilots Automatic Telephone Weather Answering Service (PATWAS), Transcribed Weather Broadcasts (TWEB), and briefing purposes. The route forecasts that are issued during the morning and mid-day are valid for 12 hours while the evening issuance is valid for 18 hours. A centralized aviation forecast program originating from the National Aviation Weather Advisory Unit (NAWAU) in Kansas City was implemented in November 1982. In the conterminous U.S., all In-flight Advisories (SIGMET's, convective SIGMET's, and AIRMET's) and all Area Forecasts (6 areas) are now issued by NAWAU. The Area Forecasts are prepared 3 times a day in the conterminous States (4 times in Hawaii), and amended as required, while In-flight Advisories are issued only when conditions warrant. See paragraph 5.8. Winds aloft forecasts are provided for 176 locations in the 48 contiguous States and 21 in Alaska for flight planning purposes. (Winds aloft forecasts for Hawaii are prepared locally.) All the aviation weather forecasts are given wide distribution through the Weather Message Switching Center in Kansas City (WMSC).

5.4.3 Weather element values may be expressed by using different measurement systems depending on several factors, such as whether the weather products will be used by the general public, aviation interests, international services, or a combination of these users. Graphic 5.4.3 provides conversion tables for the most used weather elements that will be encountered by pilots.

5.5 FAA Weather Services

5.5.1 The FAA maintains a nationwide network of Flight Service Stations (FSSs) and Supplemental Weather Service Locations (SWSLs) to serve the weather needs of pilots. In addition, National Weather Service (NWS) meteorologists are assigned to most Air Route Traffic Control Centers (ARTCCs) as part the Center Weather Service Unit (CWSU). They provide advisory service and short-term forecasts (nowcasts) to support the needs of the FAA and other users of the system.



Graphic 5.4.3

5.5.2 The primary source of preflight weather briefings is an individual briefing obtained from a briefer at the FSS or NWS. These briefings, which are tailored to your specific flight, are available 24 hours a day through the local FSS or through the use of toll free lines (INWATS). Numbers for these services can be found in the Airport/Facility Directory under "FAA and NWS Telephone Numbers" section. They are also listed in the U.S. Government section of your local telephone directory under Department of Transportation, Federal Aviation Administration or Department of Commerce, National Weather Service. See paragraph 5.6 for the types of preflight briefings available and the type of information contained in each. SWSL personnel provide the weather report but not NOTAM information for the airport where they are located. NWS pilot briefers do not provide aeronautical information (NOTAM's, flow control advisories, etc.) nor do they accept flight plans.

5.5.3 Other sources of weather information are as follows:

5.5.3.1 The A.M. Weather telecast on the PBS television network is a jointly sponsored 15-minute weather program designed for pilots. It is broadcast Monday through Friday mornings. Check TV listings in your area for station and exact times.

5.5.3.2 The Transcribed Weather Broadcast (TWEB), telephone access to the TWEB (TEL-TWEB), the Telephone Information Briefing Service (TIBS) (AFSS) and Pilots Automatic Telephone Weather Answering Service (PATWAS) (FSS) provide continuously updated recorded weather information for short or local flights. Separate paragraphs in this section give additional information regarding these services.

5.5.3.3 Weather and aeronautical information is also available from numerous private industry sources on an individual or contract pay basis. Information on how to obtain this service should be available from local pilot organizations.

5.5.3.4 The Direct User Access System (DUATS) can be accessed by pilots with a current medical certificate toll-free in the contiguous States via personal computer. Pilots can receive alpha-numeric preflight weather data and file domestic VFR and IFR flight plans. The following are the contract DUATS vendors:

CONTEL Federal Systems
15000 Conference Center Drive
Chantilly, VA 22021-3808
Telephone—*For filing flight plans and obtaining weather briefings:* 1-800-767-9989
For customer service: 1-800-345-3828

Data Transformation Corporation
108-D Greentree Road
Turnersville, NJ 08012
Telephone—*For filing flight plans and obtaining weather briefings:* 1-800-245-3828
For customer service: 1-800-243-3828

5.5.4 In-flight weather information is available from any FSS within radio range. See paragraphs 5.10-5.12 for information on broadcasts. En route Flight Advisory Service (EFAS) is provided to serve the nonroutine weather needs of pilots in flight. See paragraph 5.7 for details on this service.

5.6 Preflight Briefing

5.6.1 Flight Service Stations are the primary source of obtaining preflight briefings and in-flight weather information. In some locations, the Weather Service Office (WSO) provides preflight briefings on a limited basis. Flight Service Specialists are qualified and certificated by the NWS as Pilot Weather Briefers. They are not authorized to make original forecasts, but are authorized to translate and interpret available forecasts a reports directly into terms describing the weather conditions which you can expect along your flight route and at your destination. Available aviation weather reports and forecasts are displayed at each FSS and WSO. Some of the larger FSS's provide a separate display for pilot use. Pilots should feel free to use these self briefing displays where available, or to ask for a briefing or assistance from the specialist on duty. Three basic types of preflight briefings are available to serve your specific needs. These are Standard Briefing, Abbreviated Briefing, and Outlook Briefing. You should specify to the briefer the type of briefing you want, along with appropriate background information. (Refer to PARA-290 for items that are required.) This will enable the briefer to tailor the information to your intended flight. The following paragraphs describe the types of briefings available and the information provided in each.

5.6.2 Standard Briefing—You should request a Standard Briefing any time you are planning a flight and you have not received a previous briefing or have not received preliminary information through mass dissemination media; e.g., TWEB, PATWAS, VRS, etc. The briefer will automatically provide the following information in the sequenced listed, except as noted, when it is applicable to your proposed flight.

5.6.2.1 Adverse Conditions—Significant meteorological and aeronautical information that might influence the pilot to alter the proposed flight; e.g., hazardous weather conditions, runway closures, NAVAID outages, etc.

5.6.2.2 VFR Flight Not Recommended—When VFR flight is proposed and sky conditions or visibilities are present or forecast, surface or aloft, that in the briefer's judgment would make flight under visual flight rules doubtful, the briefer will describe the conditions, affected locations, and use the phrase "VFR flight is not recommended." This recommendation is advisory in nature. The final decision as to whether the flight can be conducted safely rests solely with the pilot.

5.6.2.3 Synopsis—A brief statement describing the type, location, and movement of weather systems and/or air masses which might affect the proposed flight.

Note. — These first 3 elements of a briefing may be combined in any order when the briefer believes it will help to more clearly describe conditions.

5.6.2.4 Current Conditions—Reported weather conditions applicable to the flight will be summarized from all available sources; e.g., SA's, PIREP's, RAREP's. This element will be omitted if the proposed time of departure is beyond two hours, unless the information is specifically requested by the pilot.

5.6.2.5 En Route Forecast—Forecast en route conditions for the proposed route are summarized in logical order; i.e., departure-climbout, en route, and descent.

5.6.2.6 Destination Forecast—The destination forecast for the planned ETA. Any significant changes within 1 hour before and after the planned arrival are included.

5.6.2.7 Winds Aloft—Forecast winds aloft will be summarized for the proposed route. The briefer will interpolate wind directions and speeds between levels and stations as necessary to provide expected conditions at planned altitudes.

5.6.2.8 Notices to Airmen (NOTAM's)

5.6.2.8.1 Available NOTAM (D) information pertinent to the proposed flight.

5.6.2.8.2 NOTAM (L) information pertinent to the departure and/or local area, if available, and pertinent FDC NOTAM's within approximately 400 miles of the FSS providing the briefing.

Note 1. — NOTAM information may be combined with current conditions when the briefer believes it is logical to do so.

Note 2. — NOTAM (D) information and FDC NOTAM's which have been published in the Notices to Airmen publication are not included in pilot briefings unless a review of this publication is specifically requested by the pilot. For complete flight information you are urged to review both the Notices to Airmen publication and the Airport/Facility Directory in addition to obtaining a briefing.

5.6.2.9 ATC Delays—Any known ATC delays and flow control advisories which might affect the proposed flight.

5.6.2.10 Pilots may obtain the following from FSS briefers upon request:

5.6.2.10.1 Information on military training routes (MTR) and military operations area (MOA) activity within the flight plan area and a 100 NM extension around the flight plan area.

Note. — Pilots are encouraged to request updated information from en route FSS's.

5.6.2.10.2 A review of the Notices to Airmen publication for pertinent NOTAM's and Special Notices.

5.6.2.10.3 Approximate density altitude data.

5.6.2.10.4 Information regarding such items as air traffic services and rules, customs/immigration procedures, ADIZ rules, search and rescue, etc.

5.6.2.10.5 LORAN-C NOTAM's.

5.6.2.10.6 Other assistance as required.

5.6.3 Abbreviated Briefing—Request an Abbreviated Briefing when you need information to supplement mass disseminated data; update a previous briefing; or when you need only one or two specific items. Provide the briefer with appropriate background information; the time you received the previous information and/or the specific items needed. You should indicate the source of the information already received so that the briefer can limit the briefing to the information that you have not received, and/or appreciable changes in meteorological conditions since your previous briefing. To the extent possible, the briefer will provide the information in the sequence shown for a Standard Briefing. If you request only one or two specific items, the briefer will advise you if adverse conditions are present or forecast. Details on these conditions will be provided at your request.

5.6.4 Outlook Briefing—You should request an Outlook Briefing whenever your proposed time of departure is six or more hours from the time of the briefing. The briefing. The briefer will provide available forecast data applicable to the proposed flight. This type of briefing is provided for planning purposes only. You should obtain a Standard or Abbreviated Briefing prior to departure in order to obtain such items as current conditions, updated forecasts, winds aloft, and NOTAM's.

5.6.5 In-flight Briefing—You are encouraged to obtain your preflight briefing by telephone or in person before departure. In those cases where you need to obtain a preflight briefing or an update to a previous briefing by radio, you should contact the nearest FSS to obtain this information. After communications have been established, advise the specialist of the type briefing you require and provide appropriate background information. You will be provided information as specified in the above paragraphs, depending on the type briefing requested. In addition, the specialist will recommend shifting to the flight watch frequency when conditions along the intended route indicate that it would be advantageous for you to do so.

5.6.6 Following any briefing, feel free to ask for any information that you or the briefer may have missed. It helps to save your questions until the briefing has been completed. This way the briefer is able to present the information in a logical sequence, and lessens the chance of important items being overlooked.

5.7 En Route Flight Advisory Service (EFAS)

5.7.1 EFAS is a service specifically designed to provide en route aircraft with timely and meaningful weather advisories pertinent to the type of flight intended, route of flight, and altitude. In conjunction with this service, EFAS is also a central collection and distribution point for pilot reported weather information. EFAS is provided by specially trained specialists in selected AFSS's/FSS's controlling multiple remote communications outlets covering a large geographical area and is normally available throughout the conterminous U.S. and Puerto Rico from 6 a.m. to 10 p.m. EFAS provides communications capabilities for aircraft flying at 5,000 feet above ground level to 17,500 feet MSL on a common frequency of 122.0 MHz. Discrete EFAS frequencies have been established to ensure communications coverage from 18,000 through 45,000 MSL serving in each specific ARTCC area. These discrete frequencies may be used below 18,000 feet when coverage permits reliable communication.

Note. — When an EFAS outlet is located in a time zone different from the zone in which the flight watch control station is located, the availability of service may be plus or minus 1 hour from the normal operating hours.

5.7.2 Contact flight watch by using the name of the Air Route Traffic Control Center facility identification serving the area of your location, followed by your aircraft identification and the name of the nearest VOR to your position. The specialist needs to know this approximate location to select the most appropriate outlet for communications coverage.

Example:

CLEVELAND FLIGHT WATCH, CESSNA ONE THREE FOUR TWO KILO, MANSFIELD V-O-R, OVER.

5.7.3 Charts depicting the location of the flight watch control stations (parent facility) and the outlets they use are contained in the Airport Facility Directories (A/FD). If you do not know in which flight watch area you are flying, initiate contact by using the words "FLIGHT WATCH," your aircraft identification, and the name of the nearest VOR. The facility will respond using the name of the flight watch facility.

Example:

FLIGHT WATCH, CESSNA ONE TWO THREE FOUR KILO, MANSFIELD V-O-R, OVER.

5.7.4 The FSS's which have implemented En Route Flight Advisory Service are listed in the Airport/Facilities Directories as appropriate.

5.7.5 EFAS is not intended to be used for filing or closing flight plans, position reporting, getting complete preflight briefings, or obtaining random weather reports and forecasts. En route flight advisories are tailored to the phase of flight that begins after

broadcast continuously over selected low-frequency (190-535 kHz) navigational aids (L/MF range or H facility) and/or VOR's. Broadcasts are made from a series of individual tape recordings, and changes, as they occur are transcribed onto the tapes. The information provided varies depending on the type equipment available. Generally, the broadcast contains route oriented data with specially prepared NWS forecasts, in-flight advisories, and winds aloft, plus preselected current information, such as weather reports, NOTAM's, and special notices. In some locations, the information is broadcast over the local VOR only and is limited to such items as the hourly weather for the parent station and up to 5 immediately adjacement stations, local NOTAM information, terminal forecast (FT) for the parent station, adverse conditions extracted from in-flight advisories, and other potentially hazardous conditions. At selected locations, telephone access to the TWEB has been provided (TEL-TWEB). Telephone numbers for this service are found in the FSS and National Weather Service Telephone Numbers section of the Airport/Facility Directory. These broadcasts are made available primarily for preflight and in-flight planning, and, as such, should not be considered as a substitute for specialist-provided preflight briefings.

5.12 In-Flight Weather Broadcasts

5.12.1 Weather Advisory Broadcasts—FAA FSS's broadcast Severe Weather Forecast Alerts (AWW), Convective SIGMET's, SIGMET's, CWA's, and AIRMET's during their valid period when they pertain to the area within 150 NM of the FSS or a broadcast facility controlled by the FSS as follows:

5.12.1.1 Severe Weather Forecast Alerts (AWW) and Convective SIGMET's—Upon receipt and at 15-minute intervals—H+00, H+15, H+30, and H+45—for the first hour after issuance.

Example:

AVIATION BROADCAST, WEATHER ADVISORY, (Severe Weather Forecast Alert or Convective SIGMET identification) (text of advisory).

5.12.1.2 SIGMET's, CWA's, and AIRMET's—Upon receipt and at 30-minute intervals—H+15 and H+45—for the first hour after issuance.

Example:

AVIATION BROADCAST, WEATHER ADVISORY, (area or ARTCC identification) (SIGMET, CWA, or AIRMET identification) (text of advisory).

5.12.1.3 Thereafter, a summarized alert notice will be broadcast at H+15 and H+45 during the valid period of the advisories.

Example:

AVIATION BROADCAST, WEATHER ADVISORY, A (Severe Weather Forecast Alert, Convective SIGMET, SIGMET, CWA, or AIRMET) IS CURRENT FOR (description of weather) (area affected).

5.12.1.4 Pilots, upon hearing the alert notice, if they have not received the advisory or are in doubt, should contact the nearest FSS and ascertain whether the advisory is pertinent to their flights.

5.12.2 ARTCC's broadcast a Severe Weather Forecast Alert (AWW), Convective SIGMET, SIGMET, or CWA alert once on all frequencies, except emergency, when any part of the area described is within 150 miles of the airspace under their jurisdiction. These broadcasts contain SIGMET or CWA (Identification) and a brief description of the weather activity and general area affected.

Example 1:

ATTENTION ALL AIRCRAFT, SIGMET DELTA THREE. FROM MYTON TO TUBA CITY TO MILFORD. SEVERE TURBULENCE AND SEVERE CLEAR ICING BELOW ONE ZERO THOUSAND FEET. EXPECTED TO CONTINUE BEYOND ZERO THREE ZERO ZERO ZULU.

Example 2:

ATTENTION ALL AIRCRAFT, CONVECTIVE SIGMET TWO SEVEN EASTERN. FROM THE VICINITY OF ELMIRA TO PHILLIPSBURG. SCATTERED EMBEDDED THUNDERSTORMS MOVING EAST AT ONE ZERO KNOTS. A FEW INTENSE LEVEL FIVE CELLS, MAXIMUM TOPS FOUR FIVE ZERO.

Example 3:

ATTENTION ALL AIRCRAFT, KANSAS CITY CENTER WEATHER ADVISORY ONE ZERO THREE. NUMEROUS REPORTS OF MODERATE TO SEVERE ICING FROM EIGHT TO NINER THOUSAND FEET IN A THREE ZERO MILE RADIUS OF ST. LOUIS. LIGHT OR NEGATIVE ICING REPORTED FROM FOUR THOUSAND TO ONE TWO THOUSAND FEET REMAINDER OF KANSAS CITY CENTER AREA.

Note. — Terminal control facilities have the option to limit the AWW, Convective SIGMET, SIGMET, or CWA broadcast as follows: local control and approach control positions may opt to broadcast SIGMET or CWA alerts only when any part of the area described is within 50 miles of the airspace under their jurisdiction.

5.12.3 Hazardous In-flight Weather Advisory Service (HIWAS)—This is a continuous broadcast of in-flight weather advisories including summarized AWW's, SIGMET's, Convective SIGMET's, CWA's, AIRMET's, and urgent PIREP's. HIWAS has been adopted as a national program and will be implemented throughout the conterminous U.S. as resources permit. In those areas where HIWAS is commissioned, ARTCC, Terminal ATC, and FSS facilities have discontinued the broadcast of in-flight advisories as described in the preceding paragraph. HIWAS is an additional source of hazardous weather information which makes these data available on a continuous basis. It is not, however, a replacement for preflight or in-flight briefings or real-time weather updates from Flight Watch (EFAS). As HIWAS is implemented in individual center areas, the commissioning will be advertised in the Notices to Airmen publication.

5.12.3.1 Where HIWAS Has Been Implemented, a HIWAS alert will be broadcast on all except emergency frequencies once upon receipt by ARTCC and terminal facilities which will include an alert announcement, frequency instruction, number, and type of advisory updated; e.g., AWW, SIGMET, Convective SIGMET, or CWA.

Example:

ATTENTION ALL AIRCRAFT, MONITOR HIWAS OR CONTRACT A FLIGHT SERVICE STATION ON FREQUENCY ONE TWO TWO POINT ZERO OR ONE TWO TWO POINT TWO FOR NEW CONVECTIVE SIGMET (identification) INFORMATION.

5.12.3.2 In HIWAS ARTCC Areas, FSS's will broadcast a HIWAS update announcement once on all except emergency frequencies upon completion of recording an update to the HIWAS broadcast. Included in the broadcast will be the type of

advisory update; e.g., AWW, SIGMET, Convective SIGMET, CWA, etc.

Example:

ATTENTION ALL AIRCRAFT, MONITOR HIWAS OR CONTACT FLIGHT WATCH OR FLIGHT SERVICE FOR NEW CONVECTIVE SIGMET INFORMATION.

5.12.4 Unscheduled Broadcasts—These broadcasts are made by FSS's on VOR and selected VHF frequencies upon receipt of special weather reports, PIREP's, NOTAM's, and other information considered necessary to enhance safety and efficiency of flight. These broadcasts will be made at random times and will begin with the announcement "Aviation broadcast" followed by identification of the data.

Example:

AVIATION BROADCAST, SPECIAL WEATHER REPORT, (Notice to Airmen, Pilot Report, etc.) (location name twice) THREE SEVEN (past the hour) OBSERVATION...etc.

5.12.5 Alaskan Scheduled Broadcasts—Selected FSS's in Alaska having voice capability on radio ranges (VOR) or radio beacons (NDB) broadcast weather reports and Notice to Airmen information at 15 minutes past each hour from reporting points within approximately 150 miles from the broadcast station.

5.13 WEATHER OBSERVING PROGRAMS

5.13.1 Manual Observations—Surface weather observations are taken at more than 600 locations in the United States. With only a few exceptions, these stations are located at airport sites and most are manned by FAA or NWS personnel who manually observe, perform calculations, and enter the observation into the distribution system. The format and coding of these observations are contained in paragraph MET-0; Appendix One.

5.13.2 Automated Weather Observing System (AWOS)

5.13.2.1 Automated weather reporting systems are increasingly being installed at airports. These systems consist of various sensors, a processor, a computer-generated voice subsystem, and a transmitter to broadcast local, minute-by-minute weather data directly to the pilot. (See MET-0; Appendix Six.)

Note. — When the barometric pressure exceeds 31.00 inches Hq., see RAC 2-1, paragraph 2.1.1.2 for the altimeter setting procedures.

5.13.2.2 The AWOS observations will include the prefix "AWOS" to indicate that the data are derived from an automated system. Some AWOS locations will be augmented by certified observers who will provide weather and obstruction to vision information in the remarks of the report when the reported visibility is less than 3 miles. These sites, along with the hours of augmentation, are to be published in the *Airport Facility Directory*. Augmentation is identified in the observation as "OBSERVER WEATHER." The AWOS wind speed, direction and gusts, temperature, dew point, and altimeter setting are exactly the same as for manual observations. The AWOS will also report density altitude when it exceeds the field elevation by more than 1,000 feet. The reported visibility is derived from a sensor near the touchdown point of the primary runway. The visibility sensor output is converted to a runway visibility value (RVV) equation using a 10-minute harmonic average. The AWOS sensors have been calibrated against the FAA transmissometer standards used for runway visual range values. Since the AWOS visibility is an extrapolation of a measurement at the touchdown point of the runway, it may differ from the standard prevailing visibility. The reported sky condition/ceiling is derived from the ceilometer located next to the visibility sensor. The AWOS algorithm integrates the last 30 minutes of ceilometer data to derive cloud layers and heights. This output may also differ from the *observer* sky condition in that the AWOS is totally dependent upon the cloud advection over the sensor site.

5.13.2.3 Referred to as AWOS (Automated Weather Observing System), these real-time systems are operationally classified into four basic levels: AWOS-A, AWOS-1, AWOS-2, and AWOS-3. AWOS-A only reports altimeter setting. AWOS-1 usually reports altimeter setting, wind data, temperature, dewpoint, and density altitude. AWOS-2 provides the information provided by AWOS-1, plus visibility. AWOS-3 provides the information provided by AWOS-2, plus cloud/ceiling data.

5.13.2.4 The information is transmitted over a discrete radio frequency or the voice portion of a local NAVAID. AWOS transmissions are receivable within 25 NM of the AWOS site, at or above 3,000 feet AGL. In many cases, AWOS signals may be received on the surface of the airport. The system transmits a 20 to 30 second weather message updated each minute. Pilots should monitor the designated frequency for the automated weather broadcast. A description of the broadcast is contained in subparagraph MET-0; 5.13.3. There is no two-way communication capability. Most AWOS sites also have a dial-up capability so that the minute-by-minute weather messages can be accessed via telephone.

5.13.2.5 AWOS information (system level, frequency, phone number, etc.) concerning specific locations is published, as the systems become operational, in the Airport/Facility Directory and, where applicable, on published Instrument Approach Procedures. Selected individual systems may be incorporated into nationwide data collection and dissemination networks in the future.

5.13.3 Automated Weather Observing System (AWOS) Broadcasts—Computer-generated voice is used in Automated Weather Observing Systems (AWOS) to automate the broadcast of the minute-by-minute weather observations. In addition, some systems are configured to permit the addition of an operator-generated voice message; e.g., weather remark, following the automated parameters. The phraseology used generally follows that used for other weather broadcasts. Following are explanations and examples of the exceptions.

5.13.3.1 Location and Time—The location/name and the phrase "AUTOMATED WEATHER OBSERVATION" followed by the time are announced.

5.13.3.1.1 If the airport's specific location is included in the airport's name, the airport's name is announced.

Examples:

"BREMERTON NATIONAL AIRPORT AUTOMATED WEATHER OBSERVATION ONE FOUR FIVE SIX ZULU."

"RAVENSWOOD JACKSON COUNTY AIRPORT AUTOMATED WEATHER OBSERVATION ONE FOUR FIVE SIX ZULU."

5.13.3.1.2 If the airport's specific location is not included in the airport's name, the location is announced followed by the airport's name.

Examples:

"SAULT STE MARIE, CHIPPEWA COUNTY INTERNATIONAL AIRPORT AUTOMATED WEATHER OBSERVATION."

"SANDUSKY, COWLEY FIELD AUTOMATED WEATHER OBSERVATION."

5.13.3.1.3 The word "TEST" is added following "OBSERVATION" when the system is not in commissioned status.

Example:

"BREMERTON NATIONAL AIRPORT AUTOMATED WEATHER OBSERVATION TEST ONE FOUR FIVE SIX ZULU."

5.13.3.1.4 The phrase "TEMPORARILY INOPERATIVE" is added when the system is inoperative.

Example:

"BREMERTON NATIONAL AIRPORT AUTOMATED WEATHER OBSERVING SYSTEM TEMPORARILY INOPERATIVE."

5.13.3.2 Ceiling and Sky Cover

5.13.3.2.1 Ceiling is announced as either "CEILING" or "INDEFINITE CEILING." The phrases "MEASURED CEILING" and "ESTIMATED CEILING" are not used. With the exception of indefinite ceilings, all automated ceiling heights are measured.

Examples:

"BREMERTON NATIONAL AIRPORT AUTOMATED WEATHER OBSERVATION ONE FOUR FIVE SIX ZULU, CEILING TWO THOUSAND OVERCAST."

"BREMERTON NATIONAL AIRPORT AUTOMATED WEATHER OBSERVATION ONE FOUR FIVE SIX ZULU, INDEFINITE CEILING TWO HUNDRED, SKY OBSCURED."

5.13.3.2.2 The word "CLEAR" is not used in AWOS due to limitations in the height ranges of the sensors. No clouds detected is announced as, "No clouds below XXX" or, in newer systems as, "Clear below XXX" (where XXX is the range limit of the sensor).

Example:

"NO CLOUDS BELOW ONE TWO THOUSAND."

"CLEAR BELOW ONE TWO THOUSAND."

5.13.3.2.3 A sensor for determining ceiling and sky cover is not included in some AWOS. In these systems, ceiling and sky cover are not announced. "SKY CONDITION MISSING" is announced only if the system is configured with a ceilometer and the ceiling and sky cover information is not available.

5.13.3.3 Visibility

5.13.3.3.1 The lowest reportable visibility value in AWOS is "less than 1/4." It is announced as "VISIBILITY LESS THAN ONE QUARTER."

5.13.3.3.2 A sensor for determining visibility is not included in some AWOS. In these systems, visibility is not announced. "VISIBILITY MISSING" is announced only if the system is configured with a visibility sensor and visibility information is not available.

5.13.3.4 Weather. In the future, some AWOS's are to be configured to determine the occurrence of precipitation. However, the type and intensity may not always be determined. In these systems, the word "PRECIPITATION" will be announced if precipitation is occurring, but the type and intensity are not determined.

5.13.3.5 Remarks. If remarks are included in the observation, the word "REMARKS" is announced following the altimeter setting. Remarks are announced in the following order of priority:

5.13.3.5.1 Automated "Remarks":

(1) Density Altitude;

(2) Varible Visibility;

(3) Variable Wind Direction.

5.13.3.5.2 Manual Input Remarks. Manual input remarks are prefaced with the phrase "OBSERVER WEATHER." As a general rule the manual remarks are limited to:

(1) Type and intensity of precipitation;

(2) Thunderstorms, intensity (if applicable), and direction;

(3) Obstructions to vision when the visibility is 3 miles or less.

Example:

"REMARKS...DENSITY ALTITUDE, TWO THOUSAND FIVE HUNDRED...VISIBILITY VARIABLE BETWEEN ONE AND TWO...WIND DIRECTION VARIABLE BETWEEN TWO FOUR ZERO AND THREE ONE ZERO...OBSERVED WEATHER...THUNDERSTORM MODERATE RAIN SHOWERS AND FOG...THUNDERSTORM OVERHEAD."

5.13.3.5.3 If an automated parameter is "missing" and no manual input for that parameter is available, the parameter is announced as "MISSING." For example, a report with the dew point "missing," and no manual input available, would be announced as follows:

Example:

"CEILING ONE THOUSAND OVERCAST, VISIBILITY THREE, PRECIPITATION, TEMPERATURE THREE ZERO, DEW POINT MISSING, WIND CALM, ALTIMETER THREE ZERO ZERO ONE."

5.13.3.5.4 "REMARKS" are announced in the following order of priority:

5.13.3.5.4.1 Automated "REMARKS."

I Density Altitude
II Variable Visibility
III Variable Wind Direction

5.13.3.5.4.2 Manual Input "REMARKS." As a general rule, the remarks are announced in the same order as the parameters appear in the basic text of the observation; i.e., Sky Condition, Visibility, Weather and Obstructions to Vision, Temperature, Dew Point, Wind, and Altimeter Setting.

Example:

"REMARKS, DENSITY ALTITUDE, TWO THOUSAND FIVE HUNDRED, VISIBILITY VARIABLE BETWEEN ONE AND TWO, WIND DIRECTION VARIABLE BETWEEN TWO FOUR ZERO AND THREE ONE ZERO, OBSERVER CEILING ESTIMATED TWO THOUSAND BROKEN, OBSERVER TEMPERATURE TWO, DEW POINT MINUS FIVE."

5.13.4 Automatic Meteorological Observing Stations (AMOS)

5.13.4.1 Full parameter AMOS facilities provide data for the basic weather program at remote, unstaffed, or part-time staffed locations at approximately ninety locations in the United States. They report temperature, dew point, wind, pressure, and precipi-

tation (liquid) amount. At staffed AMOS locations, an observer may manually add visually observed and manually calculated elements to the automatic reports. The elements manually added are sky condition, visibility, weather, obstructions to vision, and sea level pressure. The content and format of AMOS reports is the same as the manually observed reports, except the acronym "AMOS" or "RAMOS" (for Remote Automatic Meteorological Observing Station) will be the first item of the report.

5.13.4.2 Partial parameter AMOS stations only report some of the elements contained in the full parameter locations, normally wind. These observations are not normally disseminated through aviation weather circuits.

5.13.5 Automatic Observing Stations (AUTOB)—There are four AUTOB's in operation. They are located at Winslow, Arizona (INW); Sandberg, California (SDB); Del Rio, Texas (DRT); and Wendover, Utah (ENV). These stations report all normal surface aviation weather elements, but cloud height and visibility are reported in a manner different from the conventional weather report. See paragraph MET-0; Appendix Five for a description of these reports.

5.13.6 Automated Surface Observation System (ASOS)—The ASOS is the primary surface weather observing system of the United States. The program to install and operate up to 1,700 systems throughout the United States is a joint effort of the NWS, the FAA and the Department of Defense. ASOS is designed to support aviation operations and weather forecast activities. The ASOS will provide continuous minute-by-minute observations and perform the basic observing functions necessary to generate a Surface Aviation Observation (SAO) and other aviation weather information. While the automated system and the human may differ in their methods of data collection and interpretation, both produce an observation quite similar in form and content. For the "objective" elements such as pressure, ambient temperature, dew point temperature, wind, and precipitation accumulation, both the automated system and the observer use a fixed location and time-averaging technique. The quantitative differences between the observer and the automated observation of these elements are negligible. For the "subjective" elements, however, observers use a fixed time, spatial averaging technique to describe the visual elements (sky condition, visibility and present weather), while the automated systems use a fixed location, time averaging technique. Although this is a fundamental change, the manual and automated techniques yield remarkably similar results within the limits of their respective capabilities. (See MET-0; Appendix Seven.)

5.13.6.1 System Description:

5.13.6.1.1 The ASOS at each airport location consists of four main components:

(a) Individual weather sensors.

(b) Data collection package(s). (DCP)

(c) The acquisition control unit.

(d) Peripherals and displays.

5.13.6.1.2 The ASOS sensors perform the basic function of data acquisition. They continuously sample and measure the ambient environment, derive raw sensor data and make them available to the collocated DCP.

5.13.6.2 Every ASOS will contain the following basic set of sensors:

(a) Cloud height indicator (one or possibly three).

(b) Visibility sensor (one or possibly three).

(c) Precipitation identification sensor.

(d) Freezing rain sensor.

(e) Pressure sensors (two sensors at small airports; three sensors at large airports).

(f) Ambient temperature/Dew point temperature sensor.

(g) Anemometer (wind direction and speed sensor).

(h) Rainfall accumulation sensor.

5.13.6.3 The ASOS data outlets include:

(a) Those necessary for on-site airport users.

(b) National communications networks.

(c) Computer-generated voice (available through FAA radio broadcast to pilots, and dial-in telephone line).

5.13.6.4 The common ASOS reports available through these outlets include:

5.13.6.4.1 SAO messages which include message types; Scheduled Record Hourly (SA), Record Special (RS), and Special (SP) observations.

EXAMPLE:

ELEMENTS OF THE SURFACE AVIATION OBSERVATION (SAO)STATION IDENTIFIER/OBSERVATION/ TYPE/TIME/STATION TYPE/SKY CONDITION VISIBILITY/WEATHER & OBSTRUCTIONS TO VISION/ SEA-LEVEL PRESSURE/TEMPERATURE/DEW-POINT TEMPERATURE/WIND DIRECTION,SPEED & CHARACTER/ALTIMETER SETTING/ REMARKS

5.13.6.4.2 If an element in the main body of the observation (i.e., sky condition through altimeter setting) is missing, and no backup data are available, the element is encoded as M. If an element in the REMARKS section is missing, it is encoded as /.

(a) STATION IDENTIFIER—Three or four alphanumeric characters identifying the observation site.

(b) OBSERVATION TYPE—Record observations (SA) are scheduled on a routine basis; Special observations (SP) are taken whenever certain events occur; record special observations(RS) are record observations coincidental with the occurrence of certain events; urgent special observations (USP) are taken to report tornados.

(c) TIME—The time of the observation in coordinated universal time (UTC) using a 24-hour clock.

(d) STATION TYPE—Unaugmented or unedited ASOS observations are identified as AO2; ASOS observations identified as AO2A are augmented and/or edited.

(e) SKY CONDITION—CLR BLO 120 means no clouds detected below 12,000 feet over the ASOS cloud height indicator. SCT (scattered) means that .1 to .5 of sky is covered; BKN (broken) means .6 to .9 is covered; OVC (overcast) means all the sky is covered. The number preceding the SCT, BKN, or OVC is the height in hundreds of feet. The height of the BKN or OVC is preceded by a ceiling designator: M (measured) or E (estimated). If a V appears after the height, the ceiling is variable and a remark is included. W indicates an indefinite ceiling,

the number after the W is the vertical visibility in hundreds of feet, and X indicates the sky is totally obscured.

(f) VISIBILITY—ASOS reports an instrumentally derived visibility value. Reportable values are: < < ¼, ¼, ½, ¾, 1, 1 ¼, 1 ½, 1 ¾, 2, 2 ½, 3, 3 ½, 4, 5, 7, and 10+ statute miles. If the visibility is variable, a V is added to the average reportable value and a remark is included in the observation. When tower visibility is less than 4 miles and less than surface visibility, tower visibility will be reported in the body of the report as prevailing visibility, and surface visibility will be reported in remarks.

(g) WEATHER AND OBSTRUCTIONS TO VISION—Weather refers to precipitation, tornados and thunder; obstructions to vision refer to phenomena that reduce visibility but are not precipitation. ASOS reports snow (S) which is any form of frozen precipitation other than hail, rain (R), any form of liquid precipitation that does not freeze, freezing rain (ZR) any form of liquid precipitation that freezes on impact, and precipitation (P-) any light precipitation that the ASOS cannot identify as R, S or ZR. R, S, and ZR may be reported as heavy (+), moderate (no sign), or light (-). P is always light (-). Tornados (TORNADO), thunder (T), and hail (A) are augmented by an observer. Obstructions to vision are either fog (F), visible minute water droplets, or haze (H), fine suspended particles of dust, salt, combustion or, pollution products. Volcanic ash (VOLCANIC ASH) is augmented by an observer as an obstruction to vision if visibility is less than 7 miles.

(h) SEA-LEVEL PRESSURE—The theoretical pressure at sea-level reported in tenths of Hectopascals (millibars) using the last three digits without the decimal point.

(i) TEMPERATURE—Air temperature reported in degrees Fahrenheit.

(j) DEW-POINT TEMPERATURE—Temperature to which air must be cooled at constant pressure and water-vapor content for saturation to occur reported in degrees Fahrenheit.

(k) WIND—The direction reported in tens of degrees from true North from which the wind is blowing; may be estimated (E).

(l) WIND SPEED—Reported in whole knots; may be estimated (E). If wind is calm, wind direction and speed are reported as 0000.

(m) WIND CHARACTER—Gusts (G) and squalls (Q) are reported in whole knots.

(n) ALTIMETER SETTING—Used for setting aircraft altimeters; reported in hundredths of inches of mercury using only the units, tenths, and hundredths digits without a decimal point.

(o) REMARKS NOTE—Remarks underlined below are augmented and not generated automatically by ASOS.

(1) RVR—Runway Visual Range in hundredths of feet.

(2) VOLCANIC ASH—Volcanic ash is present but does not restrict visibility to less than 7 miles.

(3) VIRGA—Precipitation falling from clouds, but not reaching the ground, e.g., VIRGA VCNTY STN (Virga within 10 statute miles of the station when augmented by an observer).

(4) CIG minVmax—Variable ceiling remark, e.g., CIG 5V10 means the ceiling varies between 500 and 1,000 feet.

(5) TWR VSBY—Visibility reported by airport traffic control tower, e.g., TWR VSBY 1 indicates the visibility from the tower was 1 mile.

(6) VSBY—Visibility reported by ASOS visibility sensor.

(7) VSBY minVmax—Variable visibility remark, e.g., VSBY 1/2V2 means the visibility varies between 1/2 and 2 miles.

(8) —Btt—Ett—Time of beginning and ending of weather, e.g., RB05E20SB20E55 means that rain began at 5 minutes past the hour and ended at 20 past and snow began at 20 and ended at 55 minutes past the hour.

(9) PCPN rrrr—Hourly precipitation accumulation remark where rrrr is the liquid equivalent in hundredths of an inch of all precipitation since the last hourly observation, e.g., PCPN 0009 means that 9 hundredths of an inch fell since the last hourly observation; a trace is reported as PCPN 0000; PCPN M = missing.

(10) WSHFT hhmm—Wind shift remark with the time the wind shift began, e.g., WSHFT 1730 means the wind shift began at 1730 UTC.

(11) WND ddVdd—Variable wind direction remark, e.g., WND 03V12 means the wind is varying between 30 and 120 degrees.

(12) PK WND ddff/hhmm—Peak wind remark used whenever peak wind is over 25 knots, e.g., PK WND 2845/1715 means that a peak wind of 45 knots from 280 degrees was observed at 1715 UTC.

(13) PRESRR—Pressure rising rapidly remark.

(14) PRESFR—Pressure falling rapidly remark.

(15) PRJMP—Pressure jump remark, e.g., PRJMP 13/1250/1312 means that a pressure jump of .13 inches of mercury began at 1250 UTC and ended at 1312 UTC.

(16) PWINO—Precipitation Identifier sensor is not operational.

(17) ZRNO—Freezing rain sensor is not operational.

(18) TNO—Thunderstorm information not available.

(19) $—Maintenance check indicator.

5.13.6.5 THE AUTOMATED AND THE MANUAL SAO—In form, the automated SAO and the manual SAO look very much alike. For instance, under the same circumstances, the ASOS would report:

5.13.6.5.1 RIC SA 1950 AO2 M80 BKN 5H 123/45/40/1106/013 while the observer might report:

5.13.6.5.2 RIC SA 1951 E80 BKN 140 OVC 6H 123/45/40/1106/013 FEW CU 20 Notice that both SAO's contain the station ID, observation type, time, sky condition, visibility, obstructions to vision, sea-level pressure, ambient temperature, dew point temperature, wind, and altimeter setting. At first glance, the main differences are the ASOS station type (A02) signifying an unattended observation (i.e., human oversight not provided for ASOS backup or augmentation), the 12,000 foot upper limit in ASOS for reporting cloud height, the lower visibility increment reported by the ASOS and the cloud type remark in the manual observation. Other locations operate with on-site oversight and intervention in the form of augmentation and/or backup of the SAO message. This type of station is designated

as AO2A in the body of the SAO. The AO2A designation means that the observation contains augmented and/or backup data. The AO2 or AO2A designator will appear in all transmitted ASOS SAOs. Closer examination reveals that the ASOS reported ceiling is always measured (M), while the manual ceiling observation in this example is estimated (E). Clouds above 12,000 feet are not reported by the ASOS. The ASOS visibility of5 miles, although different from the manual observation of 6 miles, is intentionally reported as 5 miles whenever the ASOS measured visibility is between 5 and 7 miles. The final difference between the human observation and the ASOS report in the above example is in the remarks. The automated system cannot determine cloud type, range, or azimuth of cloud phenomena, and; therefore, a cloud type remark is not included in the ASOS report. The following sections will examine each of the weather elements reported by the ASOS.

(a) SKY CONDITION—The ASOS cloud sensor is a vertically pointing laser ceilometer, and is referred to as the cloud height indicator (CHI). This CHI is used to detect the presence of clouds directly overhead up to12,000 feet.

(b) VISIBILITY—ASOS sensor visibility is based on measurement of a small volume sample with extrapolation to overall real visibility. ASOS visibility is based on the scattering of light by air molecules, precipitation, fog droplets, haze specks, or other particles suspended in the air. The visibility sensor projects a beam of light, and the light that is scattered is detected by a receiver. The amount of light scattered and then received by the sensor is converted into a visibility value.

(c) PRESENT WEATHER/OBSTRUCTIONS TO VISION—There are currently two ASOS present weather sensors. They are the precipitation identification (PI) sensor which discriminates between rain and snow, and the freezing rain sensor. ASOS algorithms have also been developed to evaluate multiple sensor data and infer the presence of obstructions to vision (fog or haze). The PI sensor has the capability to detect and report R-, R, R+, S-, S, S+. When the precipitation type cannot be determined (e.g., mixed rain and snow), it will report a P-. The PI sensor has a rainfall and snow detection threshold of 0.01 inch per hour. The freezing rain sensor is sensitive enough to measure accumulation rates as low as 0.01 of an inch per hour. Only one present weather phenomenon other than thunder, tornado, or hail will be reported at one time, i.e., ASOS does not report mixed precipitation. If freezing rain is reported when the PI sensor indicates no precipitation or rain, the output is freezing rain. If freezing rain is detected when the PI indicates snow, snow is reported. Present weather remarks are generated and appended to the observation. This includes weather beginning and ending times in minutes past the current hour, e.g., ZRB05E22. Obstructions to vision (OTV) are not directly measured by ASOS, but rather inferred from measurements of visibility, temperature and dew point. All OTV's are reported as either Fog (F) or Haze (H) by ASOS. OTVs are reported only when the visibility drops below 7 statute miles.

(d) TEMPERATURE AND DEW POINT—The ASOS temperature sensors directly measure the ambient temperature and the dew point temperature. Temperature data are stored and processed to compute various required temperature parameters such as the calendar day and monthly maximum and minimum temperatures and heating and cooling degree days.

(e) WIND—The rotating cup anemometer and the simple wind vane are the principal indicators of wind speed and direction. The ASOS algorithm uses a 2-minute period to obtain average wind direction and speed. Wind character (i.e., gusts and squalls) and the peak wind are obtained by comparing the average wind speed with the maximum "instantaneous" wind speed observed over a specified time interval. All wind speeds are reported to the nearest knot. Wind direction is the direction from which the wind is blowing and is reported to the nearest 10 degrees relative to true North in the SAO message and in the daily/monthly summaries. Wind direction is reported relative to magnetic north in the computer-generated voice messages. Under appropriate conditions either a gust or a squall may be reported in the SAO observation, but not both. Where there is contention, squalls are given precedence. The ASOS will report wind remarks in the SAO such as wind shift, variable wind, and peak wind. Wind data are stored and processed to compute daily peak wind and fastest 2-minute wind parameters.

(f) PRESSURE—The pressure measurement sensors used in ASOS consist of redundant digital pressure transducers. Because of the criticality of pressure determination, three separate and independent pressure sensors are used at towered airport locations. At other locations, two pressure sensors are used. The pressure parameters available from ASOS are:

(1) Altimeter Setting.

(2) Sea Level Pressure.

(3) Density Altitude (radio broadcast only).

(4) Pressure Altitude (not transmitted).

(5) Pressure Change/Tendency.

(6) Pressure remarks (such as Pressure Rising Rapidly [PRESSRR], Pressure Jump [PRJMP], as well as pressure change and character (5appp)

(g) PRECIPITATION ACCUMULATION—ASOS uses a heated tipping bucket (HTB) precipitation gauge. The HTB at high rain rates underestimates rainfall, and a correction factor is applied to 1-minute rainfall amounts to correct for this error. The gauge data are used by ASOS to compile a variety of cumulative precipitation remarks/messages. These remarks/messages include:

(1) SAO hourly precipitation (PCPN rrrr) remark.

(2) SAO 3- and 6-hourly precipitation report (6RRR/) remark.

(3) SAO 24-Hour precipitation accumulation remark (7R24R24R24R24)

(4) Daily and monthly cumulative precipitation totals.

(5) SHEF messages.

5.13.6.6 DATA NOT PROVIDED BY ASOS—The reporting of certain weather phenomena is not part of the ASOS. Plans are currently underway to observe and report the occurrence of these phenomena from other sources. These alternate sources may include augmentation of the ASOS observation for specified phenomena at selected locations, separate observing networks for specific elements, complementary remote sensing technologies such as radar, satellites, and lightning detection systems, and of course, future enhancements to ASOS capabilities. The elements not currently sensed and reported as such by ASOS include:

(a) Tornado, funnel cloud, waterspout.

(b) Thunderstorms.

(c) Hail.

(d) Ice crystals.

(e) Snow pellets, snow grains, ice pellets.

(f) Drizzle, freezing drizzle.

(g) Volcanic ash.

(h) Blowing obstructions (snow, sand, dust, spray).

(i) Smoke.

(j) Snow fall.

(k) Snow depth.

(l) Water equivalent of snow on the ground.

(m) Clouds above 12,000 feet.

(n) Virga and distant precipitation.

(o) Distant clouds.

(p) Operationally significant local variations in visibility.

5.13.6.7 BACKUP AND AUGMENTATION—Backup is the process of either manually editing specific elements within the ASOS observation prior to dissemination, or providing a complete manual observation and alternate means of dissemination in case of total ASOS failure. Backup includes substituting manually observed data for "missing" or unrepresentative data to ensure that message content is correct and complete. No non-ASOS data element is added to the ASOS observation through backup. Backup may be applied to the ASOS-generated SAO messages or daily or monthly summary products. Augmentation is the process of adding information to an ASOS SAO message, or daily or monthly summary message, prior to dissemination, that is beyond the capabilities of ASOS. This information is derived by an observer. An example of augmentation would be adding the occurrence of thunder. ASOS may be augmented and backed up at the same time. Backup and augmented data are used by ASOS in the computations for both the daily and monthly summary products.

5.13.6.8 MISSING DATA vs NON-EVENT DATA:

5.13.6.8.1 It is possible to distinguish between missing data and a nonevent, i.e., nonoccurrence, of a parameter from an ASOS SAO. Generally, if data routinely reported in the body of an ASOS SAO is missing, an M will appear in place of the missing element. An M, however, is not placed in the present weather and obstructions to vision fields of the SAO when their sensors are determined to be inoperative. This is because these elements are derived from more than one sensor and are only reported when conditions warrant.

5.13.6.8.2 In the event that the precipitation identification sensor is not operational, the remark PWINO (Present Weather Identification Not Operational) will be placed in the remarks section of the SAO. In this case, ASOS will not be able to report R, S, or P. If the freezing rain sensor is not operational, the remark ZRNO (Freezing Rain Not Operational) will appear in the SAO's remarks. When no precipitation is occurring at the site, and if the temperature and/or dew point are not functioning, the obstruction to vision will be reported as haze if the prevailing visibility is less than seven statute miles, but greater than or equal to 4 statute miles. If the visibility is less than 4 statute miles, fog will be reported. If the temperature or dewpoint sensor, and the visibility sensor are not reporting data, it is not possible for an ASOS site to report an obstruction to vision. It is possible to distinguish missing data from nonevent occurrences in remarks by the inclusion of a slant (/) in place of the missing data.

EXAMPLE:

IAD SA 1855 AO2A CLR BLO 120 6F 101/42/41/2804 991 $

5.13.6.8.3 In this observation, ASOS was not able to automatically report temperature or dew point due to a sensor malfunction. The operator, in accordance with his/her agency's backup plan, used a sling psychrometer to observe ambient temperature and determine dew point. The operator edited the observation to enter the data manually. Note that the designation for this site was changed from AO2 to AO2A. There is, however, no indication in the body of the report that the temperature and dew point specifically were manually edited. The maintenance check indicator ($) is automatically appended to the observation by ASOS because of the inoperative temperature/dew point sensor.

EXAMPLE:

IAD SA 1555 AO2 25 SCT 7 M/M/M/3112/ 992 $

5.13.6.8.4 In this SAO, sea-level pressure, temperature, and dew point are missing. Note that sea-level pressure is missing because of the missing temperature. M is used to indicate these missing data. The dollar sign ($) at the end of the observation is a maintenance check indicator that indicates ASOS may be in need of maintenance. This is an AO2 location where an observer is not available to backup these values.

5.14 Weather Radar Services

5.14.1 The National Weather Service operates a network of 56 radar sites for detecting coverage, intensity, and movement of precipitation. The network is supplemented by FAA and DOD radar sites in the western sections of the country. Another 72 local warning radars augment the network by operating on an as needed basis to support warning and forecast programs. (See MET-0; Appendix Three.)

5.14.2 Scheduled radar observations are taken hourly and transmitted in alpha-numeric format on weather telecommunications circuits for flight planning purposes. Under certain conditions special radar reports are issued in addition to the hourly transmittals. Data contained in the reports is also collected by the National Meteorological Center and used to prepare hourly national radar summary charts for dissemination on facsimile circuits.

5.14.3 All En Route Flight Advisory Service facilities and many Flight Service Stations have equipment to directly access the radar displays from the individual weather radar sites. Specialists at these locations are trained to interpret the display for pilot briefing and in-fight advisory services. The Center Weather Service Units located in the Air Route Traffic Control Centers also have access to weather radar displays and provide support to all air traffic facilities within their center's area.

5.14.4 A clear radar display (no echoes) does not mean that there is no significant weather within the coverage of the radar site. Clouds and fog are not detected by the radar. However, when echoes are present, turbulence can be implied by the intensity of the precipitation, and icing is implied by the presence of the precipitation at temperatures at or below zero degrees Celsius. Used in conjunction with other weather products, radar provides invaluable information for weather avoidance and flight planning.

5.14.5 Additional information on weather radar products and services can be found in Advisory Circular 00-45, AVIATION WEATHER SERVICES. Also, see Pilot/Controller Glossary, Radar Weather Echo Intensity Levels, and paragraph 9, Thunderstorms. (See A/FD charts, NWS Upper Air Observing Stations and Weather Network for the location of specific radar sites.)

5.15 ATC In-Flight Weather Avoidance Assistance

5.15.1 ATC Radar Weather Display

5.15.1.1 Areas of weather clutter are radar echoes from rain or moisture. *Radars cannot detect turbulence.* The determination of the intensity of the weather displayed is based on its precipitation density. Generally, the turbulence associated with a very heavy rate of rainfall will normally be significantly more severe than any associated with a very light rainfall rate.

5.15.1.2 Air Route Traffic Control Centers are phasing in computer-generated digitized radar displays to replace the heretofore standard broadband radar display. This new system known as Narrowband Radar provides the controller with two distinct levels of weather intensity by assigning radar display symbols for specific precipitation densities measured by the narrowband system.

5.15.2 Weather Avoidance Assistance

5.15.2.1 To the extent possible, controllers will issue pertinent information of weather or chaff areas and assist pilots in avoiding such areas when requested. Pilots should respond to a weather advisory by either acknowledging the advisory or by acknowledging the advisory and requesting an alternative course of action as follows:

5.15.2.1.1 Request to deviate off course by stating the number of miles and the direction of the requested deviation. In this case, when the requested deviation is approved the pilot is expected to provide his own navigation, maintain the altitude assigned by ATC and to remain within the specified mileage of his original course.

5.15.2.1.2 Request a new route to avoid the affected area.

5.15.2.1.3 Request a change of altitude.

5.15.2.1.4 Request radar vectors around the affected areas.

5.15.2.2 For obvious reasons of safety, an IFR pilot must not deviate from the course or altitude/flight level without a proper ATC clearance. When weather conditions encountered are so severe that an immediate deviation is determined to be necessary and time will not permit approval by ATC, the pilot's emergency authority may be exercised.

5.15.2.3 When the pilot requests clearance for a route deviation or for an ATC radar vector, the controller must evaluate the air traffic picture in the affected area and coordinate with other controllers (if ATC jurisdictional boundaries may be crossed) before replying to the request.

5.15.2.4 It should be remembered that the controller's primary function is to provide safe separation between aircraft. Any additional service, such as weather avoidance assistance, can only be provided to the extent that it does not derogate the primary function. It's also worth noting that the separation workload is generally greater than normal when weather disrupts the usual flow of traffic. ATC radar limitations and frequency congestion may also be a factor in limiting the controller's capability to provide additional service.

5.15.2.5 It is very important therefore, that the request for deviation or radar vector be forwarded to ATC as far in advance as possible. Delay in submitting it may delay or even preclude ATC approval or require that additional restrictions be placed on the clearance. Insofar as possible the following information should be furnished to ATC when requesting clearance to detour around weather activity:

5.15.2.5.1 Proposed point where detour will commence.

5.15.2.5.2 Proposed route and extent of detour (direction and distance).

5.15.2.5.3 Point where original route will be resumed.

5.15.2.5.4 Flight conditions (IFR or VFR).

5.15.2.5.5 Any further deviation that may become necessary as the flight progresses.

5.15.2.5.6 Advise if the aircraft is equipped with functioning airborne radar.

5.15.2.6 To a large degree, the assistance that might be rendered by ATC will depend upon the weather information available to controllers. Due to the extremely transitory nature of severe weather situations, the controller's weather information may be of only limited value if based on weather observed on radar only. Frequent updates by pilots giving specific information as to the area affected, altitudes, intensity, and nature of the severe weather can be of considerable value. Such reports are relayed by radio or phone to other pilots and controllers and also receive widespread teletypewriter dissemination.

5.15.2.7 Obtaining IFR clearance or an ATC radar vector to circumnavigate severe weather can often be accommodated more readily in the en route areas away from terminals because there is usually less congestion and, therefore, greater freedom of action. In terminal areas, the problem is more acute because of traffic density, ATC coordination requirements, complex departure and arrival routes, adjacent airports, etc. As a consequence, controllers are less likely to be able to accommodate all requests for weather detours in a terminal area or be in a position to volunteer such route to the pilot. Nevertheless, pilots should not hesitate to advise controllers of any observed severe weather and should specifically advise controllers if they desire circumnavigation of observed weather.

5.15.3 New York Center Severe Weather Avoidance Plan

5.15.3.1 The New York Air Route Traffic Control Center will continue to utilize a plan for severe weather avoidance within its control area. Aviation oriented meteorologists provide weather information. A preplanned alternate route package developed by the center is used in conjunction with flow restrictions to ensure a more orderly flow of traffic during periods of severe or adverse weather conditions.

5.15.3.2 During these periods, airmen may expect to receive alternative route clearance into and out of the New York area. These routes are predicated upon the forecasts of the meteorologist and coordination between the Central Flow Control Facility and the other centers. They are utilized as necessary in order to allow as many aircraft as possible to operate in any given area and frequently they will deviate from the normal preferred routes. With user cooperation this plan may significantly reduce delays at the New York terminals.

5.15.3.3 Pilots departing the New York Area are requested to file their flight plans in accordance with existing procedures.

5.15.3.4 Excluding La Guardia and Newark departures via the Hampton, New York, VORTAC and the Manta, New Jersey intersection, existing SID's are utilized. La Guardia and Newark departures via Manta and Hampton are issued radar vectors to the appropriate fix.

5.15.3.5 Pilots departing the New York Metro Area are informed via the Automatic Terminal Information Service (ATIS) that "Severe Weather Avoidance Routings are in effect."

6. NOTIFICATIONS REQUIRED FROM OPERATORS

6.1 Preflight briefing and flight documentation services provided by the FAA Flight Service Station do not require prior notification.

6.2 Preflight briefing and flight documentation services provided by a National Weather Service Office is available upon request for long-range international flights for which meteorological data packages are prepared for the pilot-in-command. Briefing times should be coordinated between the local representative and the local meteorological office.

6.3 FAA Flight Service Stations do not normally have the capability to prepare meteorological data packages for preflight briefing.

7. WEATHER OBSERVING SYSTEMS AND OPERATING PROCEDURES

7.1 For surface wind readings, most meteorological reporting stations have a direct reading 3-cup anomometer wind system for which a 1 minute mean windspeed and direction (based on True North) is taken. Some stations also have a continuous windspeed recorder which is used in determining the gustiness of the wind.

7.2 Runway visual range (RVR) visibility values are measured by transmissometers mounted on towers along the runway. A full RVR system consists of:

A transmissometer projector and related items.
A transmissometer receiver (detector) and related items.
An analogue recorder.
A signal data converter and related items.
A remote digital or remote display programmer.

7.2.1 The transmissometer projector and receiver are mounted on towers either 250 or 500 feet apart. A known intensity of light is emitted from the projector and is measured by the receiver. Any obscuring matter, such as rain, snow, dust, fog, haze, or smoke, reduces the light intensity arriving at the receiver. The resultant intensity measurement is then converted to an RVR value by the signal data converter. These values are displayed by readout equipment in the associated air traffic facility and updated approximately once every minute for controller issuance to pilots.

7.2.2 The signal data converter receives information on the high intensity runway edge light setting in use (step 3, 4, or 5), transmission values from the transmissometer, and the sensing of day or night conditions. From the three data sources, the system will compute appropriate RVR values. Due to variable conditions, the reported RVR values may deviate somewhat from the true observed visual range due to the slant range consideration, brief time delays between the observed RVR conditions and the time they are transmitted to the pilot, and rapidly changing visibility conditions.

7.2.3 An RVR transmissometer established on a 500-foot baseline provides digital readouts to a minimum of 1,000 feet. A system established on a 250-foot baseline provides digital readouts to a minimum of 600 feet, which are displayed in 200-foot increments to 3,000 feet and in 500-foot increments from 3,000 feet to a maximum value of 6,000 feet.

7.2.4 RVR values for Category IIIa operations extend down to 700 feet RVR; however, only 600 and 800 feet are reportable RVR increments. The 800 RVR reportable value covers a range of 701 feet to 900 feet and is therefore a valid minimum indication of Category IIIa operations.

7.2.5 Approach categories with the corresponding minimum RVR values are as follows:

Category	*Visibility (RVR)*
Nonprecision	2,400 feet
Category I	1,800 feet
Category II	1,200 feet
Category IIIa	700 feet
Category IIIb	150 feet
Category IIIc	0

7.2.6 Ten-minute maximum and minimum RVR values for the designated RVR runway are reported in the remarks section of the aviation weather report when the prevailing visibility is less than 1 mile and/or the RVR is 6,000 feet or less. Airport traffic control towers report RVR when the prevailing visibility is 1 mile or less and/or the RVR is 6,000 feet or less.

7.2.7 Details on the requirements for the operational use of RVR are contained in FAA Advisory Circular 97-1, "Runway Visual Range." Pilots are responsible for compliance with minimums prescribed for their class of operations in appropriate Federal Aviation Regulations and/or operations specifications.

7.3 Information on cloud base height is obtained by use of ceilometers (rotating or fixed beam), ceiling lights, ceiling balloons, pilot reports, and observer estimations. The systems in use by most reporting stations are by either the observer estimation or the rotating beam ceilometer (RBC).

7.3.1 Ceiling, by definition in Federal Aviation Regulations, and as used in Aviation Weather Reports and Forecasts, is the height *above ground (or water) level* of the lowest layer of clouds or obscuring phenomenon that is reported as "broken," "overcast," or "obscuration" and not classified as "thin" or "partial." For example, a forecast which reads "CIGS WILL BE GENLY 1 TO 2 THSD FEET" refers to heights *above ground level* (AGL). A forecast which reads "BRKN TO OVC LYRS AT 8 TO 12 THSD MSL" states that the height is *above mean sea level* (MSL). See the Key to Aviation Weather Observations and Forecasts in Appendix One for the definition of "broken," "overcast," and "obscuration."

7.3.2 Pilots usually report height values above mean sea level, since they determine heights by the altimeter. This is taken in account when disseminating and otherwise applying information received from pilots. ("Ceilings" heights are always above ground level.) In reports disseminated as Pilot Reports, height references are given the same as received from pilots, that is

above mean sea level (MSL or ASL). In the following example, however, a pilot report of the heights or the bases and tops of an overcast layer in the terminal area is used in two ways in a surface aviation weather report:

E12 OVC 2FK 132/49/47/0000/002/OVC 23

Note. — In this example, the weather station has converted the pilot's report of the height of base of the overcast from the height (MSL) indicated on the pilot's altimeter to height above ground. The height of cloud tops shown in remarks (OVC 23) is *above mean sea level* (ASL or MSL) as initially reported by the pilot.

7.3.3 In aviation forecasts (Terminal Area or In-flight Advisories), ceilings are denoted by the prefix "C" when used with sky cover symbols as in "LWRG TO C5 OVC1TRW," or by the contraction "CIG" before, or the contraction "AGL" after, the forecast cloud height value. When the cloud base is given in height above mean sea level, it is so indicated by the contraction "MSL" or "ASL" following the height value. The heights of clouds tops, freezing level, icing, and turbulence are always given in heights above mean sea level (ASL or MSL).

7.4 REPORTING PREVAILING VISIBILITY

7.4.1 Surface (horizontal) visibility is reported in weather observations in terms of statute miles and increments thereof; e.g., 1/16, 1/8, 1/4, 1/2, 3/4, 1, 1 1/4, etc. Visibility is determined through the ability to see and identify preselected, prominent objects at a known distance from the usual point of observation. Visibilities that are determined to be less than 7 miles identify the obscuring atmospheric condition; e.g., fog, haze, smoke, etc., or combinations thereof.

7.4.2 Prevailing visibility is the greatest visibility equalled or exceeded throughout at least half of the horizon circle, which need not be continuous. Segments of the horizon circle which may have a significantly lower visibility may be reported in the remarks section of the weather report; i.e., the southeastern quadrant of the horizon circle may be determined to be 2 miles in fog while the remaining quadrants are determined to be 3 miles in fog.

7.4.3 When the prevailing visibility at the usual point of observation, or at the tower level, is less than 4 miles, certificated tower personnel will take visibility observations in addition to those taken at the usual point of observation. The lower of these two values will be used as the prevailing visibility for aircraft operations.

7.5 Information on Intensity of Precipitation is Determined as Follows—

7.5.1 Estimating Intensity of Precipitation (Other Than Drizzle) on Rate-of-Fall Basis:

LIGHT	Scattered drops or flakes that do not completely wet or cover an exposed surface, regardless of duration, to 0.10 inch per hour; maximum 0.01 inch in 6 minutes.
MODERATE	0.11 inch to 0.30 inch per hour; more than 0.01 inch to 0.03 inch in 6 minutes.
HEAVY	More than 0.30 inch per hour; more than 0.03 inch in 6 minutes.

7.5.2 Estimating Intensity of Drizzle on Rate-of-Fall Basis:

LIGHT	Scattered drops that do not completely wet an exposed surface, regardless of duration, to 0.01 inch per hour.
MODERATE	More than 0.01 inch to 0.02 inch per hour.
HEAVY	More than 0.02 inch per hour.

7.5.3 Intensity of Drizzle or Snow with Visibility at Usual Point of Observation as Criteria:

LIGHT	Visibility 5/8 statute mile or more.
MODERATE	Visibility less than 5/8 statute mile but not less than 5/16 statute mile.
HEAVY	Visibility less than 5/16 statute mile.

7.6 Temperature is read to the nearest whole degree Fahrenheit from remote sensing electrical resistance hygrothermometers or from observation site liquid-in-glass (mercury) thermometers.

7.7 Pending the availability of equipment, vertical wind shear and slant visual range observations are not made.

7.8 Key to Aviation Weather Reports. See Appendix One.

7.9 Key to Aviation Weather Forecasts. See Appendix One.

8. AIRCRAFT METEOROLOGICAL OBSERVATIONS AND REPORTS (AIREP'S)

8.1 Pilot Weather Reports (PIREP's)

8.1.1 FAA air traffic facilities are required to solicit PIREP's when the following conditions are reported or forecast: Ceilings at or below 5,000 feet, Visibility at or below 5 miles, Thunderstorms and related phenomena, Icing of light degree or greater, Turbulence of moderate degree or greater, and Windshear.

8.1.2 Pilots are urged to cooperate and promptly volunteer reports of these conditions and other atmospheric data, such as cloud bases, tops and layers, flight visibility, precipitation, visibility restrictions (haze, smoke, and dust), wind at altitude, and temperature aloft.

8.1.3 PIREP's should be given to the ground facility with which communications are established; i.e., EFAS, FSS, ARTCC, or terminal ATC. One of the primary duties of EFAS facilities, radio call "FLIGHT WATCH" is to serve as a collection point for the exchange of PIREP's with en route aircraft.

8.1.4 If pilots are not to make PIREP's by radio, reporting upon landing of the in-flight conditions encountered to the nearest FSS or Weather Service Office will be helpful. Some of the uses made of the reports are:

8.1.4.1 The ATCT uses the reports to expedite the flow of air traffic in the vicinity of the field and for hazardous weather avoidance procedures.

8.1.4.2 The FSS uses the reports to brief other pilots, to provide in-flight advisories, and weather avoidance information to en route aircraft.

8.1.4.3 The ARTCC uses the reports to expedite the flow of en route traffic, to determine most favorable altitudes, and to issue hazardous weather information within the center's area.

8.1.4.4 The NWS uses the reports to verify or amend conditions contained in aviation forecast and advisories. In some cases, pilot reports of hazardous conditions are the triggering mecha-

wind shear in these specific terms are encouraged to make reports in terms of the effect upon their aircraft. For example: "Miami Tower, Gulfstream 403 Charlie encountered an abrupt wind shear at 800 feet on final, max thrust required." Pilots using Inertial Navigation System should report the wind and altitude both above and below the shear layer.

8.6 PIREP's Relating to Clear Air Turbulence (CAT)

8.6.1 Clear air turbulence (CAT) has become a very serious operational factor to flight operations at all levels and especially to jet traffic flying in excess of 15,000 feet. The best available information on this phenomenon must come from pilots via the PIREP's procedures. All pilots encountering CAT conditions are urgently requested to report *time, location, and intensity* (light, moderate, severe, or extreme) of the element to the FAA facility with which they are maintaining radio contact. If time and conditions permit, elements should be reported according to the standards for other PIREP's and position reports. See Appendix Four Turbulence Reporting Criteria Table.

8.7 Microbursts

8.7.1 Relatively recent meteorological studies have confirmed the existence of microburst phenomena. Microbursts are small-scale intense downdrafts which, on reaching the surface, spread outward in all directions from the downdraft center. This causes the presence of both vertical and horizontal wind shears that can be extremely hazardous to all types and categories of aircraft, especially at low altitudes. Due to their small size, short life-span, and the fact that they can occur over areas without surface precipitation, microbursts are not easily detectable using conventional weather radar or wind shear alert systems.

8.7.2 Parent clouds producing microburst activity can be any of the low or middle layer convective cloud types. Note however, that microbursts commonly occur within the heavy rain portion of thunderstorms, and in much weaker, benign-appearing convective cells that have little or no precipitation reaching the ground.

8.7.3 The life cycle of a microburst as it descends in a convective rain shaft is seen in Figure 1. An important consideration for pilots is the fact that the microburst intensifies for about 5 minutes after it strikes the ground.

8.7.4 Characteristics of microbursts include:

8.7.4.1 Size. The microburst downdraft is typically less than 1 mile in diameter as it descends from the cloud base to about 1,000-3,000 feet above the ground. In the transition zone near the ground, the downdraft changes to a horizontal outflow that can extend to approximately 2 1/2 miles in diameter.

8.7.4.2 Intensity. The downdrafts can be as strong as 6,000 feet per minute. Horizontal winds near the surface can be as strong as 45 knots resulting in a 90 knot shear (headwind to tailwind change for a traversing aircraft) across the microburst. These strong horizontal winds occur within a few hundred feet of the ground.

8.7.4.3 Visual Signs. Microbursts can be found almost anywhere that there is convective activity. They may be embedded in heavy rain associated with a thunderstorm or in light rain in benign-appearing virga. When there is little or no precipitation at the surface accompanying the microburst, a ring of blowing dust may be the only visual clue of its existence.

8.7.4.4 Duration. An individual microburst will seldom last longer than 15 minutes from the time it strikes the ground until dissipation. The horizontal winds continue to increase during the first 5 minutes with the maximum intensity winds lasting approximately 2-4 minutes. Sometimes microbursts are concentrated into a line structure and, under these conditions, activity may continue for as long as an hour. Once microburst activity starts, multiple microbursts in the same general area are not uncommon and should be expected.

8.7.5 Microburst wind shear may create a severe hazard for aircraft within 1,000 feet of the ground, particularly during the approach to landing and landing and take-off phases. The impact of a microburst on aircraft which have the unfortunate experience of penetrating one is characterized in Figure 2. The aircraft may encounter a headwind (performance increasing), followed by a downdraft and a tailwind (both performance decreasing), possibly resulting in terrain impact.

8.7.6 Pilots should heed wind shear PIREP's, as a previous pilot's encounter with a microburst may be the only indication received. However, since the wind shear intensifies rapidly in its early stages, a PIREP may not indicate the current severity of a microburst. Flight in the vicinity of suspected or reported microburst activity should always be avoided. Should a pilot encounter one, a wind shear PIREP should be made at once.

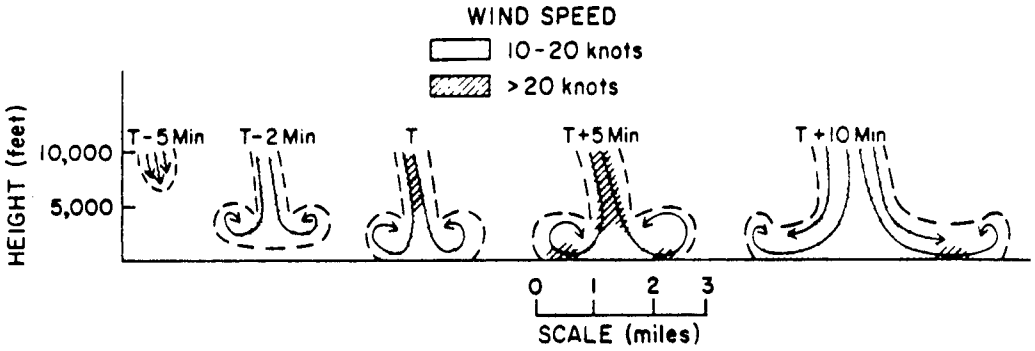


Figure 1. Vertical cross section of the evolution of a microburst wind field. T is the time of initial divergence at the surface. The shading refers to the vector wind speeds. Figure adapted from Wilson et al., 1984, Microburst Wind Structure and Evaluation of Doppler Radar for Wind Shear Detection, DOT/FAA Report No. DOT/FAA/PM-84/29, National Technical Information Service, Springfield, VA 37 pp

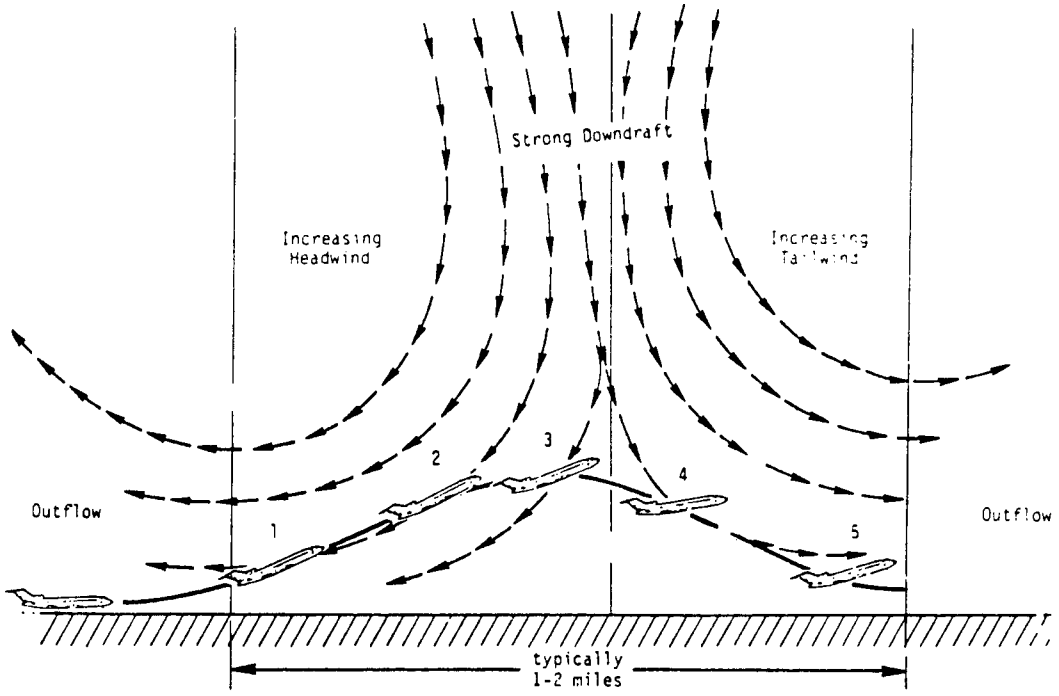


Figure 2. A microburst encounter during takeoff. The airplane first encounters a headwind and experiences increasing performance (1), this is followed in short succession by a decreasing headwind component (2), a downdraft (3), and finally a strong tailwind (4), where 2 through 5 all result in decreasing performance of the airplane. Position (5) represents an extreme situation just prior to impact. Figure courtesy of Walter Frost, FWG Associates, Inc., Tullahoma, Tennessee.

9. THUNDERSTORMS

9.1 Thunderstorms

9.1.1 Turbulence, hail, rain, snow, lightning, sustained updrafts and downdrafts, icing conditions—all are present in thunderstorms. While there is some evidence that maximum turbulence exists at the middle level of a thunderstorm, recent studies show little variation of turbulence intensity with altitude.

9.1.2 There is no useful correlation between the external visual appearance of thunderstorms and the severity or amount of turbulence or hail within them. Too, the visible thunderstorm cloud is only a portion of a turbulent system whose updrafts and downdrafts often extend far beyond the visible storm cloud. Severe turbulence can be expected up to 20 miles from severe thunderstorms. This distance decreases to about 10 miles in less severe storms. These turbulent areas may appear as a well defined echo on weather radar.

9.1.3 Weather radar, airborne or ground-based, will normally reflect the areas of moderate to heavy precipitation (radar does not detect turbulence). The frequency and severity of turbulence generally increases with the areas of highest liquid water content of the storm. NO FLIGHT PATH THROUGH AN AREA OF STRONG OR VERY STRONG RADAR ECHOES SEPARATED BY 20-30 MILES OR LESS MAY BE CONSIDERED FREE OF SEVERE TURBULENCE.

9.1.4 Turbulence beneath a thunderstorm should not be minimized. This is especially true when the relative humidity is low in any layer between the surface and 15,000 feet. Then the lower altitudes may be characterized by strong out-flowing winds and severe turbulence.

9.1.5 The probability of lightning strikes occurring to aircraft is greatest when operating at altitudes where temperatures are between -5 C and +5 C. Lightning can strike aircraft flying in the clear in the vicinity of a thunderstorm.

9.1.6 The National Weather Service recognizes only 2 classes of intensities of Thunderstorms as applied to aviation surface weather observations:

T (Moderate); T+ (Severe).

9.1.7 National Weather Service radar systems are able to objectively determine radar weather echo intensity levels by use of Video Integrator Processor (VIP) equipment. The thunderstorm intensity levels are on a scale of one to six.

Example *of an alert provided by an ATC facility to an aircraft:*

(Aircraft identification), LEVEL FIVE INTENSE WEATHER ECHO BETWEEN TEN O'CLOCK AND TWO O'CLOCK, ONE ZERO MILES, MOVING EAST AT TWO ZERO KNOTS, TOPS FLIGHT LEVEL THREE NINER ZERO.

Example *of an alert provided by a Flight Service Station:*

(Aircraft identification), LEVEL FIVE INTENSE WEATHER ECHO, TWO ZERO MILES WEST OF THE ATLANTA V-O-R, TWO FIVE MILES WIDE, MOVING EAST AT TWO ZERO KNOTS, TOPS FLIGHT LEVEL THREE NINER ZERO.

9.2 Thunderstorm Flying

9.2.1 Above all, remember this: never regard any thunderstorm lightly, even when radar observers report the echoes are of light intensity. Avoiding thunderstorms is the best policy. Following are some Do's and Don'ts of thunderstorm avoidance:

9.2.1.1 Don't land or takeoff in the face of an approaching thunderstorm. A sudden gust front of low level turbulence could cause loss of control.

9.2.1.2 Don't attempt to fly under a thunderstorm even if you can see through to the other side. Turbulence and wind shear under the storm could be disastrous.

9.2.1.3 Don't fly without airborne radar into a cloud mass containing scattered embedded thunderstorms. Scattered thunderstorms not embedded usually can be visually circumnavigated.

9.2.1.4 Don't trust the visual appearance to be a reliable indicator of the turbulence inside a thunderstorm.

9.2.1.5 Do avoid by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo. This is especially true under the anvil of a large cumulonimbus.

9.2.1.6 Do clear the top of a known or suspected severe thunderstorm by at least 1,000 feet altitude for each 10 knots of wind speed at the cloud top. This should exceed the altitude capability of most aircraft.

9.2.1.7 Do circumnavigate the entire area if the area has 6/10 thunderstorm coverage.

9.2.1.8 Do remember that vivid and frequent lightning indicates the probability of a severe thunderstorm.

9.2.1.9 Do regard as extremely hazardous any thunderstorm with tops 35,000 feet or higher whether the top is visually sighted or determined by radar.

9.2.2 If you cannot avoid penetrating a thunderstorm, following are some Do's *before* entering the storm:

9.2.2.1 Tighten your safety belt, put on your shoulder harness if you have one, and secure all loose objects.

9.2.2.2 Plan and hold your course to take you through the storm in a minimum time.

9.2.2.3 To avoid the most critical icing, establish a penetration altitude below the freezing level or above the level of -15 C.

9.2.2.4 Verify that pitot heat is on and turn on carburetor heat or jet engine anti-ice. Icing can be rapid at any altitude and cause almost instantaneous power failure and/or loss of airspeed indication.

9.2.2.5 Establish power settings for turbulence penetration airspeed recommended in your aircraft manual.

9.2.2.6 Turn up cockpit lights to highest intensity to lessen danger of temporary blindness from lightning.

9.2.2.7 If using automatic pilot, disengage altitude hold mode and speed hold mode. The automatic altitude and speed controls will increase maneuvers of the aircraft thus increasing structural stresses.

9.2.2.8 If using airborne radar, tilt the antenna up and down occasionally. This will permit you to detect other thunderstorm activity at altitudes other than the one being flown.

9.2.3 Following are some Do's and Don'ts *during* the thunderstorm penetration:

9.2.3.1 Do keep your eyes on your instruments. Looking outside the cockpit can increase danger of temporary blindness from lightning.

9.2.3.2 Don't change power settings; maintain settings for the recommended turbulence penetration airspeed.

9.2.3.3 Do maintain constant attitude; let the aircraft "ride the waves." Maneuvers in trying to maintain constant altitude increase stress on the aircraft.

9.2.3.4 Don't turn back once you are in the thunderstorm. A straight course through the storm most likely will get you out of the hazards most quickly. In addition, turning maneuvers increase stress on the aircraft.

10. WAKE TURBULENCE

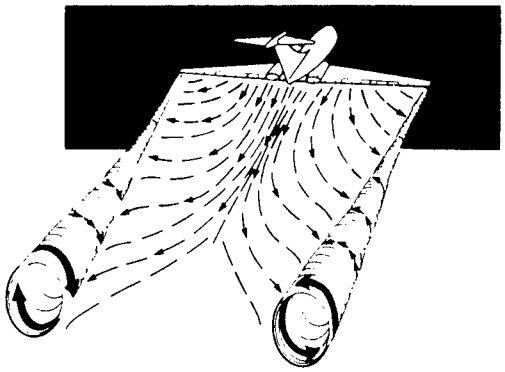
10.1 General

10.1.1 Every aircraft generates a wake while in flight. Initially, when pilots encountered this wake in flight, the disturbance was attributed to "prop wash." It is known, however, that this disturbance is caused by a pair of counterrotating vortices trailing from the wing tips. The vortices from larger aircraft pose problems to encountering aircraft. For instance, the wake of these aircraft can impose rolling moments exceeding the roll control authority of the encountering aircraft. Further, turbulence generated within the vortices can damage aircraft components and equipment if encountered at close range. The pilot must learn to envision the location of the vortex wake generated by larger (transport category) aircraft and adjust the flight path accordingly.

10.1.2 During ground operations and during takeoff, jet engine blast (thrust stream turbulence) can cause damage and upsets if encountered at close range. Exhaust velocity versus distance studies at various thrust levels have shown a need for light aircraft to maintain an adequate separation behind large turbojet aircraft. Pilots of larger aircraft should be particularly careful to consider the effects of their "jet blast" on other aircraft, vehicles, and maintenance equipment during ground operations.

10.2 Vortex Generation

10.2.1 Lift is generated by the creation of a pressure differential over the wing surface. The lowest pressure occurs over the upper wing surface and the highest pressure under the wing. This pressure differential triggers the roll up of the airflow aft of the wing resulting in swirling air masses trailing downstream of the wing tips. After the roll up is completed, the wake consists of two counter rotating cylindrical vortices. Most of the energy is within a few feet of the center of each vortex, but pilots should avoid a region within about 100 feet of the vortex core.



Graphic 10.2.1

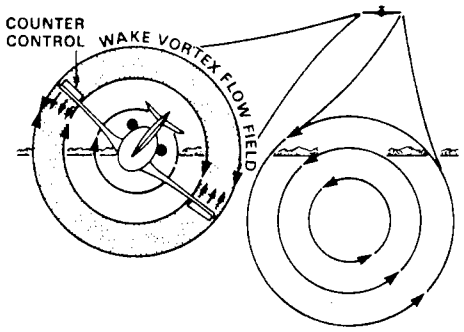
10.3 Vortex Strength

10.3.1 The strength of the vortex is governed by the weight, speed, and shape of the wing of the generating aircraft. The vortex characteristics of any given aircraft can also be changed by extension of flaps or other wing configuring devices as well as by change in speed. However, as the basic factor is weight the vortex strength increases proportionately. Peak vortex tangential speeds up to almost 300 feet per second have been recorded. The greatest vortex strength occurs when the generating aircraft is HEAVY, CLEAN, and SLOW.

10.3.2 Induced Roll

10.3.2.1 In rare instances a wake encounter could cause in-flight structural damage of catastrophic proportions. However, the usual hazard is associated with induced rolling moments which can exceed the roll control authority of the encountering aircraft. In flight experiments, aircraft have been intentionally flown directly up trailing vortex cores of larger aircraft. It was shown that the capability of an aircraft to counteract the roll imposed by the wake vortex primarily depends on the wing span and counter-control responsiveness of the encountering aircraft.

10.3.2.2 Counter-control is usually effective and induced roll minimal in cases where the wing span and ailerons of the encountering aircraft extend beyond the rotational flow field of the vortex. It is more difficult for aircraft with short wing span (relative to the generating aircraft) to counter the imposed roll induced by vortex flow. Pilots of short-span aircraft, even of the high-performance type, must be especially alert to vortex encounters.



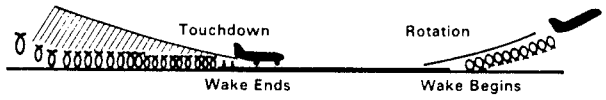
Graphic 10.3.2.2

10.3.2.3 The wake of larger aircraft requires the respect of all pilots.

10.4 Vortex Behavior

10.4.1 Trailing vortices have certain behavioral characteristics which can help a pilot visualize the wake location and thereby take avoidance precautions.

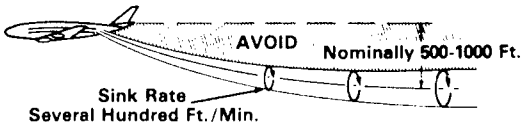
10.4.1.1 Vortices are generated from the moment aircraft leave the ground, since trailing vortices are a by-product of wing lift. Prior to takeoff or touchdown pilots should note the rotation or touchdown point of the preceding aircraft.



Graphic 10.4.1.1

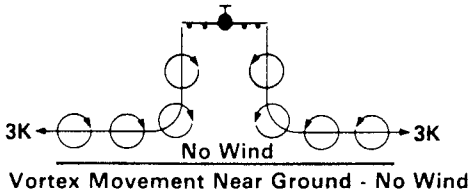
10.4.1.2 The vortex circulation is outward, upward and around the wing tips when viewed from either ahead or behind the aircraft. Tests with large aircraft have shown that the vortices remain spaced a bit less than a wing span apart, drifting with the wind, at altitudes greater than a wing span from the ground. In view of this, if persistent vortex turbulence is encountered, a slight change of altitude and lateral position (preferably upwind) will provide a flight path clear of the turbulence.

10.4.1.3 Flight tests have shown that the vortices from larger (transport category) aircraft sink at a rate of several hundred feet per minute, slowing their descent and diminishing in strength with time and distance behind the generating aircraft. Atmospheric turbulence hastens breakup. Pilots should fly at or above the preceding aircraft's flight path, altering course as necessary to avoid the area behind and below the generating aircraft. However vertical separation of 1,000 feet may be considered safe.



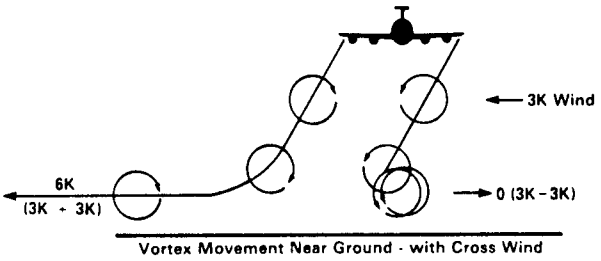
Graphic 10.4.1.3

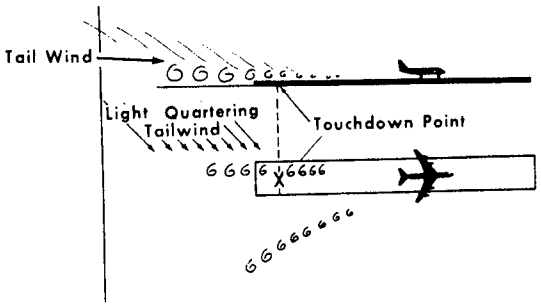
10.4.1.4 When the vortices of larger aircraft sink close to the ground (within 100 to 200 feet), they tend to move laterally over the ground at a speed of 2 or 3 knots.



Graphic 10.4.1.4

10.4.2 A crosswind will decrease the lateral movement of the upwind vortex and increase the movement of the downwind vortex. Thus a light wind with a cross-runway component of 1 to 5 knots could result in the upwind vortex remaining in the touchdown zone for a period of time and hasten the drift of the downwind vortex toward another runway. Similarly, a tailwind condition can move the vortices of the preceding aircraft forward into the touchdown zone. THE LIGHT QUARTERING TAILWIND REQUIRES MAXIMUM CAUTION. Pilots should be alert to larger aircraft upwind from their approach and takeoff flight paths.





Graphic 10.4.2

10.5 Operations Problem Areas

10.5.1 A wake encounter can be catastrophic. In 1972 at Fort Worth a DC-9 got too close to a DC-10 (two miles back), rolled, caught a wingtip, and cartwheeled coming to rest an inverted position on the runway. All aboard were killed. Serious and even fatal GA accidents induced by wake vortices are not uncommon. However, a wake encounter is not necessarily hazardous. It can be one or more jolts with varying severity depending upon the direction of the encounter, weight of the generating aircraft, size of the encountering aircraft, distance from the generating aircraft, and point of vortex encounter. The probability of induced roll increases when the encountering aircraft's heading is generally aligned with the flight path of the generating aircraft.

10.5.2 AVOID THE AREA BELOW AND BEHIND THE GENERATING AIRCRAFT, ESPECIALLY AT LOW ALTITUDE WHERE EVEN A MOMENTARY WAKE ENCOUNTER COULD BE HAZARDOUS. This is not easy to do. Some accidents have occurred even though the pilot of the trailing aircraft had carefully noted that the aircraft in front was at a considerably lower altitude. Unfortunately, this does not ensure that the flight path of the lead aircraft will be below that of the trailing aircraft.

10.5.3 Pilots should be particularly alert in calm wind conditions and situations where the vortices could:

10.5.3.1 Remain in the touchdown area.

10.5.3.2 Drift from aircraft operating on a nearby runway.

10.5.3.3 Sink into the takeoff or landing path from a crossing runway.

10.5.3.4 Sink into the traffic pattern from other airport operations.

10.5.3.5 Sink into the flight path of VFR aircraft operating on the hemispheric altitude 500 feet below.

10.5.4 Pilots of all aircraft should visualize the location of the vortex trail behind larger aircraft and use proper vortex avoidance procedures to achieve safe operation. It is equally important that pilots of larger aircraft plan or adjust their flight paths to minimize vortex exposure to other aircraft.

10.6 Vortex Avoidance Procedures

10.6.1 Under certain conditions, airport traffic controllers apply procedures for separating IFR aircraft. The controllers will also provide to VFR aircraft, with whom they are in communication and which in the tower's opinion may be adversely affected by wake turbulence from a larger aircraft, the position, altitude and direction of flight of larger aircraft followed by the phrase "CAUTION - WAKE TURBULENCE." WHETHER OR NOT A WARNING HAS BEEN GIVEN, HOWEVER, THE PILOT IS EXPECTED TO ADJUST HIS OR HER OPERATIONS AND FLIGHT PATH AS NECESSARY TO PRECLUDE SERIOUS WAKE ENCOUNTERS.

10.6.2 The following vortex avoidance procedures are recommended for the various situations:

10.6.2.1 Landing behind a larger aircraft - same runway: Stay at or above the larger aircraft's final approach flight path - note its touchdown point - land beyond it.

10.6.2.2 Landing behind a larger aircraft - when a parallel runway is closer than 2,500 feet: Consider possible drift to your runway. Stay at or above the larger aircraft's final approach flight path - note his touchdown point.

10.6.2.3 Landing behind a larger aircraft - crossing runway: Cross above the larger aircraft's flight path.

10.6.2.4 Landing behind a departing larger aircraft - same runway: Note the larger aircraft's rotation point - land well prior to rotation point.

10.6.2.5 Landing behind a departing larger aircraft - crossing runway: Note the larger aircraft's rotation point - if past the intersection - continue the approach - land prior the intersection. If larger aircraft rotates prior to the intersection, avoid flight below the larger aircraft's flight path. Abandon the approach unless a landing is ensured well before reaching the intersection.

10.6.2.6 Departing behind a larger aircraft: Note the larger aircraft's rotation point - rotate prior to larger aircraft's rotation point -continue climb above the larger aircraft's climb path until turning clear of his wake. Avoid subsequent headings which will cross below and behind a larger aircraft. Be alert for any critical takeoff situation which could lead to a vortex encounter.

10.6.2.7 Intersection takeoffs - same runway: Be alert to adjacent larger aircraft operations, particularly upwind of your runway. If intersection takeoff clearance is received, avoid subsequent heading which will cross below a larger aircraft's path.

10.6.2.8 Departing or landing after a larger aircraft executing a low approach, missed approach or touch-and-go landing: Because vortices settle and move laterally near the ground,

the vortex hazard may exist along the runway and in your flight path after a larger aircraft has executed a low approach, missed approach or a touch-and-go landing, particular in light quartering wind conditions. You should ensure that an interval of at least 2 minutes has elapsed before your takeoff or landing.

10.6.2.9 En route VFR (thousand-foot altitude plus 500 feet): Avoid flight below and behind a large aircraft's path. If a larger aircraft is observed above on the same track (meeting or overtaking) adjust your position laterally, preferably upwind.

10.7 Helicopters

10.7.1 In a slow hover-taxi or stationary hover near the surface, helicopter main rotor(s) generate downwash producing high velocity outwash vortices to a distance approximately three times the diameter of the rotor. When rotor downwash hits the surface, the resulting outwash vortices have behavioral characteristics similar to wing tip vortices produced by fixed wing aircraft. However, the vortex circulation is outward, upward, around, and way from the main rotor(s) in all directions. Pilots of small aircraft should avoid operating within three rotor diameters of any helicopter in a slow hover taxi or stationary hover. In forward flight, departing or landing helicopters produce a pair of strong, high-speed trailing vortices similar to wing tip vortices of larger fixed-wing aircraft. Pilots of small aircraft should use caution when operating behind or crossing behind landing and departing helicopters.

10.8 Pilot Responsibility

10.8.1 Government and industry groups are making concerted efforts to minimize or eliminate the hazards of trailing vortices. However, the flight disciplines necessary to ensure vortex avoidance during VFR operations must be exercised by the pilot. Vortex visualization and avoidance procedures should be exercised by the pilot using the same degree for concern as in collision avoidance.

10.8.2 Wake turbulence may be encountered by aircraft in flight as well as when operating on the airport movement area. (See wake turbulence definition under glossary of aeronautical terms.)

10.8.3 Pilots are reminded that in operations conducted behind all aircraft, acceptance of instructions from ATC in the following situations is an acknowledgment that the pilot will ensure safe takeoff and landing intervals and accepts the responsibility of providing his own wake turbulence separation:

10.8.3.1 Traffic information,

10.8.3.2 Instructions to follow an aircraft, and

10.8.3.3 The acceptance of a visual approach clearance.

10.8.4 For operations conducted behind heavy aircraft, ATC will specify the word "heavy" when this information is known. Pilots of heavy aircraft should always use the word "heavy" in radio communications.

10.9 Air Traffic Wake Turbulence Separations

10.9.1 Because of the possible effects of wake turbulence, controllers are required to apply no less than specified minimum separation for aircraft operating behind a heavy jet and, in certain instances, behind large nonheavy aircraft.

10.9.1.1 Separation is applied to aircraft operating directly behind a heavy jet at the same altitude or less than 1,000 feet below:

10.9.1.1.1 Heavy jet behind jet—4 miles.

10.9.1.1.2 Small/large aircraft behind heavy jet—5 miles.

10.9.1.2 Also, separation, measured at the time the preceding aircraft is over the landing threshold, is provided to small aircraft:

10.9.1.2.1 Small aircraft landing behind heavy jet—6 miles.

10.9.1.2.2 Small aircraft landing behind large aircraft—4 miles.

Note. — See Aircraft Classes in Pilot/Controller Glossary.

10.9.1.3 Additionally, appropriate time or distance intervals are provided to departing aircraft. Two minutes or the appropriate 4 or 5 mile radar separation when takeoff behind a heavy jet will be—

10.9.1.3.1 From the same threshold.

10.9.1.3.2 On a crossing runway and projected flight paths will cross.

10.9.1.3.3 From the threshold of a parallel runway when staggered ahead of that of the adjacent runway by less than 500 feet and when the runways are separated by less than 2,500 feet.

Note. — Pilots, after considering possible wake turbulence effects, may specifically request waiver of the 2-minute interval by stating, "request waiver of 2-minute interval," or a similar statement. Controllers may acknowledge this statement as pilot acceptance of responsibility for wake turbulence separation and, if traffic permits, issue takeoff clearance.

10.9.2 A 3-minute interval will be provided when a small aircraft will takeoff from an intersection on the same runway (same or opposite direction) behind a departing large aircraft, or in the opposite direction on the same runway behind a large aircraft takeoff or low/missed approach.

Note. — This 3-minute interval may be waived upon specific pilot request.

10.9.3 A 3-minute interval will be provided for all aircraft taking off when the operations are as described in (Para. 10.9.2) above, the preceding aircraft is a heavy jet, and the operations are on either the same runway or parallel runways separated by less than 2,500 feet. "Controllers may not reduce or waive this interval."

10.9.4 Pilots may request additional separation; i.e., 2 minutes instead of 4 or 5 miles for wake turbulence avoidance. This request should be made as soon as practical on ground control and at least before taxiing onto the runway.

Note. — FAR 91.3(a) states: "The pilot in command of an aircraft is directly responsible for and is the final authority as to the operation of that aircraft."

10.9.5 Controllers may anticipate separation and need not withhold a takeoff clearance for an aircraft departing behind a large/heavy aircraft if there is reasonable assurance the required separation will exist when the departing aircraft starts takeoff roll.

11. International Civil Aviation Organization (ICAO) Terminal Forecast (TAF)

11.1 Terminal forecasts for international locations and domestic military locations are available to the Flight Service Station specialist, via their weather computer. Domestic military locations are availabe to the pilot, via the Direct User Access Terminal (DUAT), but are in an international alphanumeric code. They are scheduled four times daily, for 24-hour periods, beginning at 0000Z, 0600Z, 1200Z and 1800Z.

11.2 Format. The TAF is a series of groups made up of digits and letters. An individual group is identified by its position in the sequence, by its alphanumeric coding or by a numerical indicator. Listed below are a few contractions used in the TAF. Some of the contractions are followed by time entries indicated by "tt" or "tttt" or by probability, "pp".

11.2.1 Significant weather change indicators.

GRADU tttt— A gradual change occurring during a period in excess of one-half hour. "tttt" are the beginning and ending times of the expected change to the nearest hour; i.e., "GRADU 1213" means the transition will occur between 1200Z and 1300Z.

RAPID tt— A rapid change occurring in one-half hour or less. "tt" is the time to the nearest hour of the change; i.e., "RAPID 23" means the change will occur about 2300Z.

Variability terms— indicate that short time period variations from prevailing conditions are expected with the total occurrence of these variations less than ½ of the time period during which they are called for.

TEMPO tttt— Temporary changes from prevailing conditions of less than one hour duration in each instance. There may be more than one (1) instance for a specified time period. "tttt" are the earliest and latest times during which the temporary changes are expected; i.e., "TEMPO 0107" means the temporary changes may occur between 0100Z and 0700Z.

INTER tttt— Changes from prevailing conditions are expected to occur frequently and briefly. "tttt" are the earliest and latest times the brief changes are expected; i.e., "INTER 1518" means that the brief, but frequent, changes may occur between 1500Z and 1800Z. INTER has shorter and more frequent changes than TEMPO.

11.2.2 Probability.

PROB pp— Probability of conditions occurring. "pp" is the probability in per cent; i.e., "PROB 20" means a 10 or 20% probability of the conditions occurring. "PROB 40" means a 30 to 50% inclusive probability.

11.2.3 Cloud and weather terms.

CAVOK— No clouds below 5,000 feet or below the highest minimum sector altitude whichever is greater, and no cumulonibus. Visibility 6 miles or greater. No precipitation, thunderstorms, shallow fog or low drifting snow.

WX NIL— No significant weather (no precipitation, thunderstorms or obstructions to vision).

SKC— Sky clear.

11.3 Following is a St. Louis MO forecast in TAF code.

KSTL 1212 33025/35 0800 71SN 9//05 INTER 1215 0000 75XXSN 9//000 GRADU 1516 33020 4800 38BLSN 7SC030 PROB 40 85SNSH GRADU 2122 33015 9999 WX NIL 3SC030 RAPID 00 VRB05 9999 SKC GRADU 0304 24015/25 CAVOK

11.3.1 The forecast is broken down into the elements lettered "a" to "l" to aid in the discussion. Not included in the example but explained at the end are three optional forecast groups for "m" icing, " n" turbulence and "0" temperature.

KSTL	1212	33025/35
a.	b.	c.

0800	71SN	9//005
d.	e.	f.

INTER 1215 0000 75XXSN 9//000

g.

GRADU 1516 33020 4800 38BLSN 7SC030

h.

PROB 40 85SNSH

i.

GRADU 2122 33015 9999 WX NIL 3SC030

j.

RAPID 00 VRB05 9999 SKC

k.

GRADU 0304 24015125 CAVOK

l.

a. *Station identifier.* The TAF code uses ICAO 4-letter station identifiers. In the contiguous 48 states the 3-letter identifier is prefixed with a "K"; i.e., the 3-letter identifier for Seattle is SEA while the ICAO identifier is KSEA. Elsewhere, the first two letters of the ICAO identifier tell what region the station is in. "MB" means Panama/Canal Zone (MBHO is Howard AFB); "MI" means Virgin Islands (MISX is St. Croix); "MJ" is Puerto Rico (MJSJ is San Juan); "PA" is Alaska (PACD is Cold Bay); PH" is Hawaii (PHTO is Hilo).

b. *Valid time.* Valid time of the forecast follows station identifier. "1212" means a 24-hour forecast valid from 1200Z until 1200Z the following day.

c. *Wind.* Wind is forecast usually by a 5-digit group giving degrees in 3 digits and speed in 2 digits. When wind is expected to be 100 knots or more, the group is 6-digits with speed given is 3 digits. When speed is gusty or variable, peak speed is separated from average speed with a slash. For example, in the KSTL TAF, "33025/35" means wind 330 degrees, average speed 25 knots, peak speed 35 knots. A group "160115/130" means wind 160 degrees, 115 knots, peak speed 130 knots. "00000" means calm; "VRB" followed by speed indicates direction variable; i.e., "VRBI0" means wind direction variable at 10 knots.

d. *Visibility.* Visibility is in meters. TABLE (1.) is a table for converting meters to miles and fractions. "0800" means 800 meters converted from table to ½ mile.

TABLE 1. Visibility conversion TAF code to miles

Meters	Miles	Meters	Miles	Meters	Miles
0000	0	1200	¾	3000	1 ⅞
0100	1/16	1400	⅞	3200	2
0200	⅛	1600	1	3600	2 ¼
0300	3/16	1800	1	4000	2 ½
0400	¼	2000	1 ¼	4800	3
0500	5/16	2200	1 ⅜	6000	4
0600	⅜	2400	1 ½	8000	5

TABLE 1. Visibility conversion TAF code to miles Continued

Meters	Miles	Meters	Miles	Meters	Miles
0800	½	2600	1 ⅝	9000	6
1000	⅝	2800	1 ¾	9999	>6

e. *Significant weather.* Significant weather is decoded using TABLE (2.). Groups in the table are numbered sequentially. Each number is followed by an acronym suggestive of the weather; you can soon learn to read most of the acronyms without reference to the table. Examples: "177TS", thunderstorm; "18SQ", squall; "31SA", sandstorm; "60RA", rain; "85SNSH", snow shower. "XX" freezing rain. In the KSTL forecast, "71SN" means light snow. The TAF encodes only the single most significant type of weather; the U.S. domestic FT permits encoding of multiple weather types. See TABLE (3.) to convert weather from FT to TAF.

TABLE 2. TAF weather codes

Code	Simple Definition	Detailed Definition
04FU	Smoke	Visibility reduced by smoke. No visibility restriction.
05HZ	Dust haze	Visibility reduced by haze. No visibility restriction.
06HZ	Dust haze	Visibility reduced by dust suspended in the air but wind not strong enough to be adding more dust. No visibility restriction. *
* While this may seem to be contradictory, it means that while visibility is restricted, the amount of the restriction is not limited.		
07SA	Duststorm, sandatorm, rising dust or sand	Visibility reduced by dust suspended in the air and wind strong enough to be adding sand more dust. No well developed dust devils, duststorm or sandstorm. Visibility 6 miles or less.
08PO	Dust devil	Basically the same as 07SA but with well developed dust devils. Visibility 6 miles or less.
10BR	Mist	Fog, ground fog or ice fog with visibility ⅝ to 6 miles.
11MIFG	Shallow fog	Patchy shallow fog (less than 6 feet deep and coverage less than half) with visibility in the fog less than ⅝ mile.
12MIFG	Shallow fog	Shallow fog (less than 6 feet deep with more or less continuous coverage) with visibility in the fog less than ⅝ miles.
17TS	Thunderstorm	Thunderstorm at the station but with no precipitation.
18SQ	Squall	No precipitation. A sudden increase of at least 15 knots in average wind speed, sustained at 20 knots or more for at least one (1) minute.
19FC	Funnel cloud	Used to forecast a tornado, funnel cloud or waterspout at or near the station. Also not easy to forecast and likely to be overshadowed by some other more violent weather such as thunderstorms.
30SA	Duststorm, sandstorm, rising dust or sand.	Duststorm or sandstorm, visibility 5/16 to less than ⅝ mile, increasing in intensity.
31SA		Basically the same as 30SA but with no change in intensity.
32SA		Basically the same as 30SA but increasing in intensity.
33XXSA	Heavy duststorm or sandstorm.	Severe duststorm or sandstorm, visibility, less than 5/16 mile, decreasing in intensity.
34XXSA		Basically the same as 33XXSA but with no change in intensity.
35XXSA		Basicallv the same as 33XXSA but increasing in intensity.
36DRSN	Low drifting snow.	Low drifting snow (less than 6 feet) with visibility in drifting snow less than 5/16 miles.
37DRS		Low drifting snow (less than 6 feet) with visibility in drifting snow less than 5/16 miles.
38BLSN	Blowing snow.	Blowing snow (more than 6 feet) with visibility 5/16 to 6 miles.

TABLE 2. TAF weather codes—Continued

Code	Simple Definition	Detailed Definition
39BLSN		Blowing snow (more than 6 feet) with visibility 5/16 to 6 miles.
40BCFG	Fog	Distant fog (not at station).
41BCFG	patches	Patchy fog at the station. visibility in the fog patches less than 5/8 of a mile.
42FG		Fog at the station. visibility less than 5/8 mile, sky visible, fog thinning.
43FG		Fog at the station, visibility less than 5/8 mile, sky not visible, fog thinning.
44FG		Fog at the station,less than 5/8 mile, sky visible, no change in intensity. Fog
45FG		Fog at the station, visibility less than 5/8 mile. sky not visible, no change in intensity.
46FG		Fog at the station, visibility less than 5/8 mile, sky visible, fog thickening,
47FG		Fog at the station, visiblity less than 5/8 mile, sky not visible, fog thickening.

NOTE: In code figures 40 through 47,"fog"includes both fog and ice fog. See FMH No.1 (Surface Observations) for definitions of precipitation intensities.

48FZFG	Freezing	Fog depositing rime ice, visibility fogless than 5/8 mile, sky visible.
49FZFG		Fog depositing rime ice, visibility less than 5/8 mile, sky not visible.
50DZ	Drizzle	Light intermittent drizzle.
51DZ		Light continuous drizzle.
52DZ		Moderate intermittent drizzle.
53DZ		Moderate continuous drizzle.
54XXDZ	Heavy drizzle.	Heavy intermittent drizzle.
55XXDZ		Heavy continuous drizzle.
56XXDZ	Freezing drizzle	Light freezing drizzle.
57XXFZDZ	Heavy freezing drizzle.	Moderate or heavy freezing drizzle.
58RA		Mixed rain and drizzle, light.
59RA		Mixed rain and drizzle, moderate or heavy.
60RA	Rain	Light intermittent rain.
61RA		Light continuous rain.
62RA		Moderate intermittent rain.
63RA		Moderate continuous rain.
64XXRA	Heavy rain.	Heavy intermittent rain.
65XXRA		Heavy continuous rain.
66FZRA	Freezing rain	Freezing rain or mixed freezing rain and freezing drizzle, light.
67XXFZRA	Heavy freezing rain	Freezing rain or mixed freezing rain and freezig drizzle, moderate or heavy.
68RASN	Rain and snow	Mixed rain and snow or drizzle and snow, light.
69XXRASN	Heavy rain and snow.	Mixed rain and snow or drizzle and and snow.snow, moderate or heavy.
70SN		Light intermittent snow.

TABLE 2. TAF weather codes—Continued

Code	Simple Definition	Detailed Definition
71SN		Light continuous snow.
72SN	snow	Moderate intermittent snow.
73SN		Moderate continuous snow.
74XXSN	Heavy snow	Heavy intermittent snow.
75XXSN		Heavy continuous snow.
77SG	Snow grains	Snow grains, any intensity. May be accompanied by fog or ice fog.
79PE	Ice pellets	Ice pellets, any intensity. May be mixed with some other precipitation.
80RASH	Showers	Light rain showers.
81XXSH	Heavy	Moderate or heavy rain showers.
82XXSH	showers	Violent rain showers (more than 1 inch per hour or 0.1 inch in 6 minutes).
83RASN	Showers of rain and	Mixed rain showers and snow showers. Intensity of both showers is light.
84XXRASN	Heavy showers of rain and	Mixed rain showers and snowshowers. Intensity of either shower is moderate or heavy.
85SNSH	Snow showers	Light snow showers.
86XXSNSH	Heavy snow showers	Moderate or heavy snow showers.
87GR		Light ice pellet showers. There may also be rain or mixed rain or snow.
88GR	soft hail	Moderate or heavy ice pellet showers. There may also be rain or mixed rain and snow.
89GR	Hail	Hail, not associated with a Thunder-storm. There may also be rain or mixed rain and snow.
90XXGR	Heavy hail	Moderate or heavy hail, not associated with a thunderstorm. There may also be rain or mixed rain or snow.
91RA	Rain	Light rain or light rain shower at the time of the forecast and thunderstorms during the preceding hour, but not at the time of the forecast.
92XXRA	Heavy rain	Basically the same as 91RA but the intensity of the rain or rain shower is moderate or heavy.
93GR	Hail	Basically the same as 91RA, but the precipitation is light snow or snow showers, or light mixed rain and snow or rain showers and snow showers, or light ice pellets or ice pellet showers.
94XXGR	Heavy hail	Basically the same as 93GR but the intensity of any precipitation is moderate or heavy.
95TS	Thunderstorm	Thunderstorm with rain or snow, or a mixture of rain and snow, but no hail, ice pellets or snow pellets.
96TSGR	Thunderstorm with hail	Thunderstorm with hail, ice pellets or snow pellets. There may also be rain or snow, or mixed rain and snow.
97XXTS	Heavy thunderstorm	Severe thunderstorm with rain or snow, or a mixture of rain and snow, but no hail, ice pellets or snow pellets.
98TSSA	Thunderstorm with duststorm or sandstorm	Thunderstorm with dust storm or sandstorm. There may also be some form of precipitation with the thunderstorm.
99XXTSGR	Heavy thunderstorm with hail	Basically the same as 97XXTS but in addition to everything else there is hail.

TABLE 3. Converting significant weather from U.S. terms to ICAO terms.

		Precipitation & Intensity		
US	TAF Code	Light	Moderate	Heavy
A	89GR			
BD or BN (vsby 5/16 to 1/2 mi)	31SA			
BD or BN (vsby 0 to 1/4 mi)	34XXSA			
BS (vsby 6 mi or less)	38BLSN			
D (vsby 6 mi or less)	06HZ			
GF (vsby 1/2 mi or less)	44FG			
H (vsby 6 mi or less)	05HZ			
F or IF (vsby 1/2 mi or less)	45FG			
F, GF or IF (vsbv 5/8 to 6 mi)	10BR			
IP	79PE			
IPW	87GR			
K	04FU			
L		51DZ	53DZ	55DZ
R		61RA	63RA	64RA
RS		68RASN	68RASN	69XXRASN
RW		80RASH	80RASH	81XXSH
RWSW		83RASN	83RASN	84XXRASN
S		71SN	73SN	75XXSN
SG	77SG			
SP	87GR			
SW		85SNSH	85SNSH	86XXSNSH
ZL		56FZDZ	56FZDZ	57XXFZDZ
ZR		66FZRA	67XXFZRA	67XXFZRA
TRW- or TRW	95TS			INTER 81XXSH
TRW+	95TS			INTER 82XXSH*
TRW-A or TRWA	96TSGR			
T+RW	97XXTS			
T-RW+	97XXTS 97XXTS			INTER 81XXSH INTER 82XXSH*
T+RWA	99XXTSGR			
T+RW+A	99XXTSGR 99XXTSGR			INTER 81XXSH INTER 82XXSH*

*INTER 82XXSH is to be encoded in a TAF only when a violent rainshower (at least 1 inch of rain per hour or 0.10 inch in 6 minutes) is forecast.

NOTE: Conversions from TAF to FT will not be exact in some cases due to a lack of a one to one relationship.

f. *Clouds.* A cloud group is a 6-character group. The first digit is coverage in octas (eighths) of the individual cloud layer only. The summation of cloud layer to determine total sky cover from a ground observers point of view is NOT used. See TABLE (4.). The two letters identify cloud type as shown in the same table. The last three digits are cloud height in hundreds of feet above ground level (AGL). In the KSTL TAF, "9//005" means sky obscured (9), clouds not observed (//), vertical visibility 500 feet (005). The TAF may include as many cloud groups as necessary to describe expected sky condition.

TABLE 4. TAF Cloud Code

Code	Cloud amount	Cloud Type
0	0 (clear)	CI Cirrus
1	1 octa or less but not zero	CC Cirrocumulus
2	2 octas	CS Cirrostratus
3	3 octas	AC Altocumulus
4	4 octas	AS Altostratus
5	5 octas	NS Nimbostratus
6	6 octas	SC Stratocumulus
7	7 octas or more but not 8 octas	ST Stratus
		CU Cumulus
8	8 octas (overcast)	CB Cumulonimbus
9	Sky obscured or cloud	// cloud not visible amount not estimated due to darkness or obscuring phenomena

g. Expected variation from prevailing conditions. Variations from prevailing conditions are identified by the contractions INTER and TEMPO as defined earlier. In the KSTL TAF, "INTER 1215 0000 75XXSN 9//000" means intermittently from 1200Z to 1500Z (1215) visibility zero meters (0000) or zero miles, heavy snow (75XXSN), sky obscured, clouds not observed, vertical visibility zero (9//000).

h, i, j, k, and l. expected change in prevailing conditions is indicated by the contraction GRADU and RAPID as defined earlier. In the KSM TAF, "GRADU 1516 33020 4800 38BLSN 7SC030" means a gradual change between 1500Z and 1600Z to wind 330 degrees at 20 knots, visibility 4,800 meters or 3 miles (TABLE 1.), blowing snow, 7/8 stratocumulus (TABLE 4.) at 3000 feet AGL. "PROB 40 85SNSH" means there is a 30 to 50% probability that light snow showers will occur between 1600Z and 2100Z. "GRADU 2122 33015 9999 WX NIL 3SC030" means a gradual change between 2100Z and 2200Z to wind 330 degrees at 15 knots, visibility 10 kilometers or more (more than 6 miles), no significant weather, 3/8 stratocumulus at 3000 feet. "RAPID 00 VRB05 9999 SKC" means a rapid change about 0000Z to wind direction variable at 5 knots, visibility more than 6 miles, sky clear. "GRADU 0304 24015/25 CAVOK " means a gradual change between 0300Z and 0400Z to wind 240 degrees at 15 knots, peak gust to 25 knots with CAVOK conditions. means end of message.

m. *Icing.* An icing group may be included. It is a 6-digit group. The first digit is always a 6, identifying it as an icing group. The second digit is the type of ice accretion from TABLE (5.). The next three digits are height of the base of the icing layer in hundreds of feet (AGL). The last digit is the thickness of the layer in thousands of feet. For example, let's decode the group "680304". The "6" indicates an icing forecast; the"8" indicates severe icing in cloud; "030" says the base of the icing is at 3,000 feet (AGL); and "4" specifies a layer 4,000 feet thick.

TABLE 5. TAF Icing

Figure Code	Amount of ice accretion
0	No icing
I	Light icing
2	Light icing in cloud
3	Light icing in precipitation
4	Moderate icing
5	Moderate icing in cloud
6	Moderate icing in precipitation
7	Severe icing
8	Severe icing in cloud
9	Severe icing in precipitation

n. *Turbulence.* A turbulence group also may be included. It also is a 6-digit group coded the same as the icing group except a "5" identifies the group as a turbulence forecast. Type of turbulence is from TABLE (6.). For example, decoding the group "590359", the "5" indentifies a turbulence forecast; the "9" specifies frequent severe turbulence in cloud (TABLE 4.); "035" says the base of the turbulent layer is 3,500 feet (AGL); the "9" specifies that the turbulence layer is 9,000 feet thick. When either an icing layer or a turbulent layer is expected to be more than 9,000 feet thick, multiple groups are used. The top specified in one group is coincident with the base in the following group. Let's assume the forecaster expects frequent turbulence from the surface to 45,000 feet with the most hazardous turbulence at mid-levels. This could be encoded "530005 550509 592309 553209 554104". While you most likely will never see such a complex coding with this many groups, the flexible TAF code permits it.

TABLE 6. TAF Turbulence

Figure Code	Turbulence
0	None
1	Light Turbulence
2	Moderate turbulence in clear air, infrequent
3	Moderate turbulence in clear air, frequent
4	Moderate turbulence in cloud, infrequent
5	Moderate turbulence in cloud, frequent,
6	Severe turbulence in clear air, infrequent
7	Severe turbulence in clear air, frequent
8	Severe turbulence in cloud, infrequent
9	Severe turbulence in cloud, frequent

o. *Temperature.* A temperature code is seldom included in a terminal forecast. However, it may be included if critical to aviation. It may be used to alert the pilot to high density altitude or possible frost when on the ground. The temperature group is identified by the digit "0". The next two (2) digits are the time to the nearest whole hour (GMT) to which the forecast temperature applies. The last two (2) digits are temperature in degrees Celsius. A minus temperature is preceded by the letter "M".

Examples: "02137" means temperature at 2100Z is expected to be 37 degrees Celsius (about 99 degrees F); "012M02" means temperature at 1200Z is expected to be minus 2 degrees Celsius. A forecast may include more than one temperature group.

APPENDIX ONE

KEY TO AVIATION WEATHER OBSERVATIONS

LOCATION IDENTIFIER TYPE AND TIME OF REPORT *	SKY AND CEILING	VISIBILITY WEATHER AND OBSTRUCTION TO VISION	SEA-LEVEL PRESSURE	TEMPERATURE AND DEW POINT	WIND	ALTIMETER SETTING	REMARKS AND CODED DATA
MCI SA Ø758	**15 SCT M25 OVC**	**1R-F**	**132**	**/58/56**	**/1807**	**/993/**	**R01VR20V40**

SKY AND CEILING

Sky cover contractions are for each layer in ascending order. Figures preceding contractions are base heights in hundreds of feet above station elevation. Sky cover contractions used are:

CLR = Clear. Less than Ø.1 sky cover
SCT = Scattered. Ø.1 to Ø.5 sky cover
BKN = Broken. Ø.6 to Ø.9 sky cover
OVC = Overcast. More than Ø.9 sky cover

— = Thin (When prefixed to SCT, BKN, OVC)
—X = Partly obscured. Ø.9 or less of sky hidden by precipitation or obstruction to vision (bases at surface)
X = Obscured. 1.Ø sky hidden by precipitation or obstruction to vision (bases at surface)

A letter preceding the height of a base identifies a ceiling layer and indicates how ceiling height was determined. Thus:

E = Estimated
M = Measured
W = Vertical visibility into obscured sky

V = Immediately following the height of a base indicates a variable ceiling

VISIBILITY

Reported in statute miles and fractions. (V = Variable)

WEATHER AND OBSTRUCTION TO VISION SYMBOLS

A	Hail	IC	Ice crystals	S	Snow
BD	Blowing dust	IF	Ice fog	SG	Snow grains
BN	Blowing sand	IP	Ice pellets	SP	Snow pellets
BS	Blowing snow	IPW	Ice pellet showers	SW	Snow showers
D	Dust	K	Smoke	T	Thunderstorms
F	Fog	L	Drizzle	T+	Severe thunderstorm
GF	Ground fog	R	Rain	ZL	Freezing drizzle
H	Haze	RW	Rain showers	ZR	Freezing rain

Precipitation intensities are indicated thus: - Light, (no sign) Moderate, + Heavy

WIND Direction in tens of degrees from true north, speed in knots. ØØØØ indicates calm. G indicates gusty. Q indicates Squalls. Peak wind speed in the past 1Ø minutes follows G or Q when gusts or squalls are reported. The contraction WSHFT, followed by GMT time group in remarks, indicates windshift and its time of occurrence. (Knots x 1.15 = statute mi/hr)

EXAMPLES: 3627 = wind from 36Ø Degrees at 27 knots.
3627G4Ø = wind from 36Ø Degrees at 27 knots, peak speed in gusts 4Ø knots

ALTIMETER SETTING

The first figure of the actual altimeter setting is always omitted from the report.

RUNWAY VISUAL RANGE (RVR)

RVR is reported from some stations. For planning purposes, the value range during 1Ø minutes prior to observations and based on runway light setting 5 are reported in hundreds of feet. Runway identification precedes RVR report.

PILOT REPORTS (PIREPs)

When available, PIREPs in fixed format may be appended to weather observations. PIREPs are designated by UA or UUA for urgent PIREPs.

DECODED REPORT

Kansas City International. Record observation completed at Ø758 UTC. 15ØØ feet scattered clouds, measured ceiling 25ØØ feet overcast, visibility 1 mile, light rain, fog, sea-level pressure 1Ø13.2 millibars, temperature 58°F, dewpoint 56°F, wind from 18Ø° at 7 knots, altimeter setting 29.93 inches. Runway Ø1, visual range 2ØØØ feet, lowest 4ØØØ feet, highest in the past 1Ø minutes.

* TYPE OF REPORT

SA = a scheduled record observation
SP = an unscheduled special observation indicating a significant change in one or more elements
RS = a scheduled record observation that also qualifies as a special observation

The designator for all three types of observations (SA, SP, RS) is followed by a 24-hour-clock-time-group in Coordinated Universal Time (UTC or Z).

U.S. DEPARTMENT OF COMMERCE—**NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION**—NATIONAL WEATHER SERVICE

KEY TO AVIATION WEATHER FORECASTS

TERMINAL FORECASTS contain information for specific airports on expected ceiling, cloud heights, cloud amounts, visibility, weather and obstructions to vision, and surface wind. They are issued 3 times/day, amended as needed, and are valid for up to 24 hours. The last six hours of each forecast period are covered by a categorical statement indicating whether VFR, MVFR, IFR or LIFR conditions are expected. (L in LIFR and M in MVFR indicate "low" and "marginal".) Terminal forecasts are written in the following form:

CEILING: Identified by the letter "C" (for lowest layer with cumulative sky cover greater than 5/1Ø)
CLOUD HEIGHTS: In hundreds of feet above the station (ground)
SKY COVER AMOUNT (including any obscuration)
CLOUD LAYERS: Stated in ascending order of height
VISIBILITY: In statute miles (omitted if over 6 miles)
WEATHER AND OBSTRUCTION TO VISION: Standard weather and obstruction to vision symbols are used
SURFACE WIND: In tens of degrees and knots (omitted when less than 6 knots)

EXAMPLE OF TERMINAL FORECAST

DCA 2210Z: DCA Forecast 22nd day of month - valid time 1ØZ-1ØZ
1ØSCT C1Ø BKN 5SW—3415G25 OCNL C8 X 1/2SW: Scattered clouds at 1ØØØ feet, ceiling 18ØØ feet broken, visibility 5 miles, light snow showers, surface wind from 34Ø degrees at 15 knots. Gusts to 25 knots, occasional ceiling 8 hundred feet sky totally obscured, visibility 1/2 mile in moderate snow showers
12Z C5Ø BKN 3312G22: By 12Z becoming ceiling 5ØØØ feet broken, surface wind 33Ø degrees at 12 knots. Gusts to 22
Ø4Z MVFR CIG: Last 6 hours of FT after Ø4Z marginal VFR due to ceiling

AREA FORECASTS are 12-hour aviation forecasts plus a 6-hour categorical outlook prepared 3 times/day, with each section amended as needed, giving general descriptions of potential hazards, airmass and frontal conditions, icing and freezing level, turbulence and low-level windshear, and significant clouds and weather for an area the size of several states. Heights of cloud bases and tops, turbulence and icing are referenced ABOVE MEAN SEA LEVEL (MSL), unless indicated by Ceiling (CIG) or ABOVE GROUND LEVEL (AGL). Each SIGMET OR AIRMET affecting an FA area will also serve to amend the Area Forecast.

SIGMET, AIRMET and CWA messages (in-flight advisories) broadcast by FAA on NAVAID voice channels warn pilots of potentially hazardous weather. SIGMET's concern severe and extreme conditions of importance to all aircraft (i.e., icing, turbulence and dust storms, sandstorms or volcanic ash). Convective SIGMET's are issued for thunderstorms if they are sufficiently strong, wide spread or embedded. AIRMET's concern less severe conditions which may be hazardous to aircraft particularly smaller aircraft and less experienced or VFR only pilots. CWA's (Center Weather Advisories) concern both SIGMET and AIRMET type conditions described in greater detail and relating to a specific ARTCC area.

WINDS AND TEMPERATURES ALOFT (FD) FORECASTS are 6, 12, and 24-hour forecasts of wind direction (nearest 10° true N) and speed (knots) for selected flight levels. Forecast Temperatures Aloft (°C) are included for all but the 3ØØØ-foot level.

EXAMPLES OF WINDS AND TEMPERATURES ALOFT (FD) FORECASTS
FD WBC 121645
BASED ON 1212ØØZ DATA
VALID 13ØØØØZ FOR USE 2100-0600Z. TEMPS NEG ABV 24ØØØ FT

	3ØØØ	6ØØØ	9ØØØ	12ØØØ	18ØØØ	24ØØØ	3ØØØØ	34ØØØ	39ØØØ
BOS	3127	3425Ø7	3428 11	3421 16	3516 27	3512 38	311649	292451	283451
JFK	3826	3327Ø8	3324 12	3322 16	3128 27	2923 38	284248	285158	285749

At 6ØØØ feet MSL over JFK wind from 33Ø° at 27 knots and temperature minus 8°C

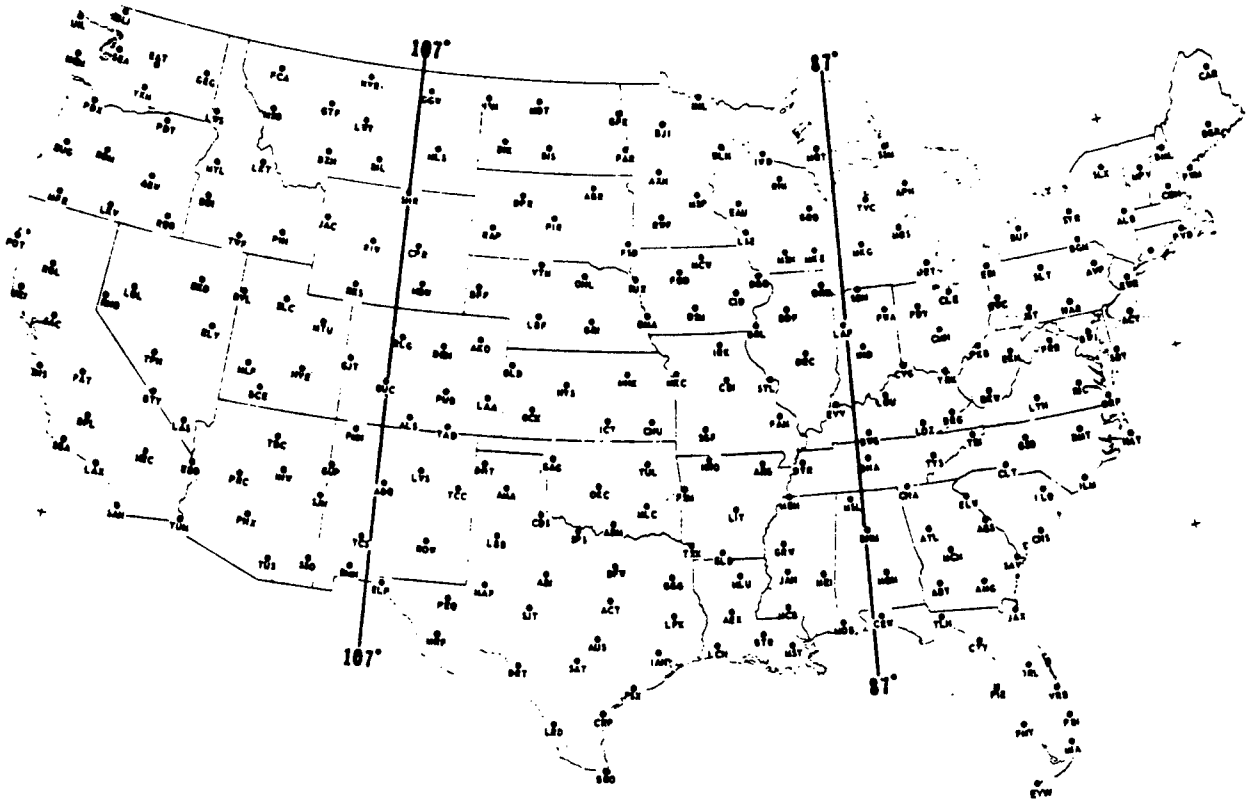
TWEB (CONTINUOUS TRANSCRIBED WEATHER BROADCAST)-Individual route forecasts covering a 25-nautical-mile zone either side of the route. By requesting a specific route number, detailed en route weather for a 15-hour period plus a synopsis can be obtained.

PILOTS. . . . report in-flight weather to nearest FSS. The latest surface weather reports are available by phone at the nearest pilot weather briefing office by calling at H + 10.

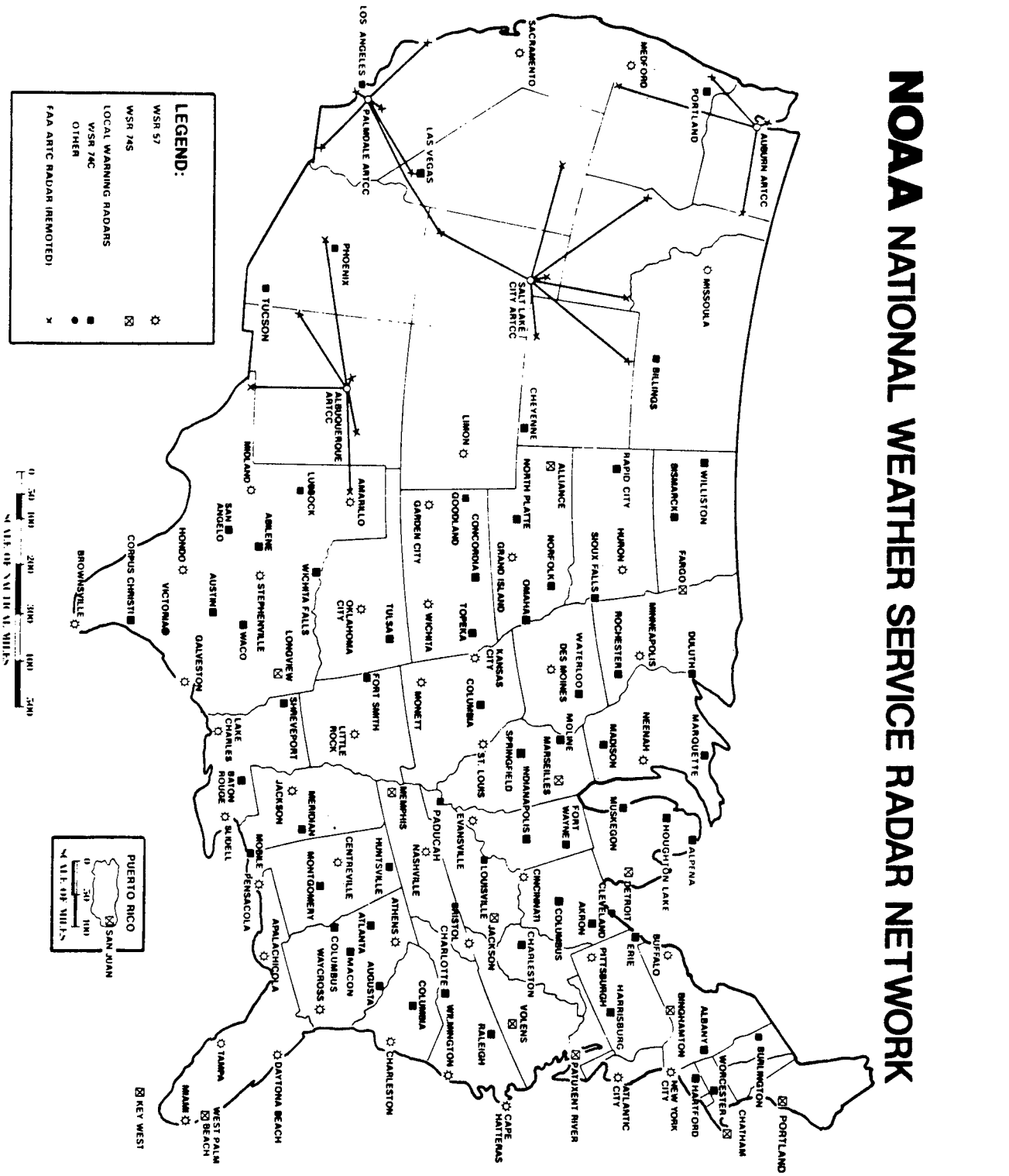
U.S. DEPARTMENT OF COMMERCE—**NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION**—NATIONAL WEATHER SERVICE—REVISED JANUARY 1987

APPENDIX TWO

IN-FLIGHT WEATHER ADVISORY PROGRAM



APPENDIX THREE



APPENDIX FOUR

TURBULENCE REPORTING CRITERIA TABLE

INTENSITY	AIRCRAFT REACTION	REACTION INSIDE AIRCRAFT	REPORTING TERM-DEFINITION
Light	Turbulence that momentarily causes slight, erratic changes in altitude and/or attitude (pitch, roll, yaw). Report as **Light Turbulence**;* or Turbulence that causes slight, rapid and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude. Report as **Light Chop**.	Occupants may feel a slight strain against seat belts or shoulder straps. Unsecured objects may be displaced slightly. Food service may be conducted and little or no difficulty is encountered in walking.	Occasional - Less than 1/3 of the time. Intermittent - 1/3 to 2/3. Continuous - More than 2/3.
Moderate	Turbulence that is similar to Light Turbulence but of greater intensity. Changes in altitude and/or attitude occur but the aircraft remains in positive control at all times. It usually causes variations in indicated airspeed. Report as **Moderate Turbulence**;* or Turbulence that is similar to Light Chop but of greater intensity. It causes rapid bumps or jolts without appreciable changes in aircraft altitude or attitude. Report as **Moderate Chop**.	Occupants feel definite strains against seat belts or shoulder straps. Unsecured objects are dislodged. Food service and walking are difficult.	**NOTE** 1. Pilots should report location(s), time (UTC), intensity, whether in or near clouds, altitude, type of aircraft and, when applicable, duration of turbulence. 2. Duration may be based on time between two locations or over a single location. All locations should be readily identifiable. EXAMPLES: a. Over Omaha, 1232Z, Moderate Turbulence, in cloud, Flight Level 310, B707. b. From 50 miles south of Albuquerque to 30 miles north of Phoenix, 1210Z to 1250Z, occasional Moderate Chop, Flight Level 330, DC8.
Severe	Turbulence that causes large, abrupt changes in altitude and/or attitude. It usually causes large variations in indicated airspeed. Aircraft may be momentarily out of control. Report as **Severe Turbulence**. *	Occupants are forced violently against seat belts or shoulder straps. Unsecured objects are tossed about. Food service and walking are impossible.	
Extreme	Turbulence in which the aircraft is violently tossed about and is practically impossible to control. It may cause structural damage. Report as **Extreme Turbulence.***		

* High level turbulence (normally above 15,000 feet ASL) not associated with cumuliform cloudiness, including thunderstorms, should be reported as CAT (clear air turbulence) preceded by the appropriate intensity, or light or moderate chop.

APPENDIX FIVE

DECODING OBSERVATIONS FROM AUTOB STATIONS

EXAMPLE: **ENV AUTOB E25 BKN BV7 P 33/29/3606/975 PK WND 08 001**

ENCODE	*DECODE*	*EXPLANATION*
ENV	STATION IDENTIFICATION:	(Wendover, UT) Identifies report using FAA identifiers.
AUTOB	AUTOMATIC STATION IDENTIFIER:	
E25 BKN	SKY & CEILING:	(Estimated 2500 ft. broken) Figures are height in 100's of feet above ground. Contraction after height is amount of sky cover. Letter preceding height indicates ceiling. WX reported if visibility is less than 2 miles and no clouds are detected. *NO CLOUDS REPORTED ABOVE 6,000 FEET.*
BV7	BACKSCATTER VISIBILITY AVERAGED IN PAST MINUTE:	Reported in whole miles from 1 to 7.
P	PRECIPITATION OCCURRENCE:	(P=Precipitation in past 10 minutes).
33	TEMPERATURE:	(33 degrees F.) Minus sign indicates sub-zero temperatures.
/29	DEW POINT:	(29 degrees F.) Minus sign indicates sub-zero temperatures.
/3606	WIND:	(360 degrees true at 6 knots) Direction is first two digits and is reported in tens of degrees. To decode, add a zero to first two digits. The last digits are speed; e.g., 2524 = 250 degrees at 24 knots.
/975	ALTIMETER SETTING:	(29.75 inches) The tens digit and decimal are omitted from report. To decode, prefix a 2 to code if it begins with 8 or 9. Otherwise, prefix a 3; e.g., 982 = 29.82, 017 = 30.17.
PK WND 08	PEAK WIND SPEED:	(8 knots) Reported speed is highest detected since last hourly observation.
001	PRECIPITATION ACCUMULATION:	(0.01 inches) Amount of precipitation since last synoptic time (00, 06, 12, 1800 UTC).

Note. — If no clouds are detected below 6,000 feet and the visibility is greater than 2 miles, the reported sky condition will be *CLR BLO 60.*

KEY TO AWOS (AUTOMATED WEATHER OBSERVING SYSTEM) OBSERVATIONS

LOCATION IDENTIFIER TYPE OF REPORT TIME OF REPORT STATION TYPE	SKY CONDITION AND CEILING BELOW 12,000'	VISIBILITY	TEMPERATURE / DEW POINT / WIND DIRECTION, SPEED AND CHARACTER / ALTIMETER SETTING /	REMARKS: **AUTOMATED** REMARKS GENERATED AUTOMATICALLY IF CONDITIONS EXIST. **AUGMENTED** REMARKS ADDED **IF** CONDITIONS EXIST **AND** CERTIFIED WEATHER OBSERVER IS ATTENDING THE SYSTEM
HTM SA 1755 AWOS	**M20 OVC**	**1V**	**36/34/2015G25/990/**	**P010/VSBY 1/2V2 WND 17V23/WEA: R — F**

LOCATION IDENTIFIER: 3 or 4 alphanumeric characters (usually the airport identifier).

TYPE OF REPORT: SA = Scheduled record (routine) observation. All observations identified as SA. Most are transmitted at 20-minute intervals (approximately 15, 35 and 55 minutes past each hour).

TIME OF REPORT: Coordinated Universal Time (UTC or Z) using 24-hour clock.

STATION TYPE: AWOS = Automated Weather Observing System site. **Note:** In the future, some systems will use " A0 " designators.

SKY CONDITION AND CEILING: Sky condition contractions are for each layer in ascending order. Numbers preceding contractions are base heights in hundreds of feet above ground level (AGL).

CLR BLO 120 = No clouds below 12,000 ft.
SCT = Scattered: 0.1 to 0.5 sky cover.
BKN = Broken: 0.6 to 0.9 sky cover.
OVC = Overcast: More than 0.9 sky cover.
X = Obscured sky **—X** = Partially obscured

A letter preceding the height of a base identifies a ceiling layer and indicates how ceiling height was determined.

M = Measured **W** = Indefinite

VISIBILITY: Reported in statute miles and fractions. Visibility greater than 10 not reported. **V**= variable: see Automated Remarks

TEMPERATURE AND DEW POINT: Reported in degrees Fahrenheit.

WIND DIRECTION, SPEED & CHARACTER: Direction in tens of degrees from true north, except voice broadcast is in degrees magnetic. Speed in knots. **0000** = calm. **G** = gusts. See Automated Remarks for variable direction.

ALTIMETER SETTING: Hundredths of inches of mercury. Shown as last 3 digits only without decimal point (e.g., 30.05 inches = 005).

PRESENT WEATHER/OBSTRUCTIONS TO VISION: Reported only when observer is available. See Augmented Remarks. In the future, some systems will report precipitation, fog, and haze in the body of the observation.

AUTOMATED REMARKS: Precipitation accumulation reported in hundredth of inches (e.g., P110 = 1.10 inches; P010 = 0.10 inch). **WND V** = variable wind direction. **VSBY V** = variable visibility. **DENSITY ALTITUDE** is included in the voice broadcast when more than 1000 feet above airport elevation.

MISSING DATA: Reported as " M ".

AUGMENTED REMARKS: " WEA: " indicates manual observer data. Remarks include operationally significant weather conditions within a five mile radius of the airport (e.g., thunderstorms, precipitation, obstructions to vision when visibility is 3 miles or less, fog banks). Standard weather observation contractions are used.

DECODED REPORT: Hometown Municipal Airport, observation at 1755 UTC, AWOS report. Measured ceiling 2000 feet overcast. Visibility 1 mile variable. Temperature 36 degrees (F), dew point 34 degrees (F), wind from 200 degrees true at 15 knots gusting to 25 knots, altimeter setting 29.90 inches. Precipitation accumulation during past hour 0.10 inch. Visibility variable between 1/2 and 2 miles. Wind direction variable from 170 degrees to 230 degrees true. Observer reports light rain (R—) and fog (F).

NOTE: Refer to the *Airman's Information Manual* for more information. Refer to the *Airport/Facility Directory*, aeronautical charts, and related publications for broadcast, telephone and location data. Check *Notices to Airmen* for AWOS system status.

U.S. DEPARTMENT OF TRANSPORTATION — FEDERAL AVIATION ADMINISTRATION **9/15/92**

KEY TO ASOS (AUTOMATED SURFACE OBSERVING SYSTEM) WEATHER OBSERVATIONS

LOCATION IDENTIFIER TYPE OF REPORT TIME OF REPORT STATION TYPE	SKY CONDITION AND CEILING BELOW 12,000'	VISIBILITY, WEATHER, AND OBSTRUCTIONS TO VISION	SEA-LEVEL PRESSURE / TEMPERATURE / DEW POINT / WIND DIRECTION, SPEED AND CHARACTER / ALTIMETER SETTING /	REMARKS AUTOMATED REMARKS GENERATED AUTOMATICALLY IF CONDITIONS EXIST. AUGMENTED REMARKS ADDED IF CONDITIONS EXIST AND CERTIFIED WEATHER OBSERVER IS ATTENDING THE SYSTEM	STATUS REMARKS SYSTEM GENERATED
HTM RS 1755 A02A	**M19V OVC**	**1R — F**	**125/36/34/2116G24/990/**	**R29LVR10V50 CIG 16V22 TWR VSBY 2 PK WND 2032/1732 PRESFR**	**ZRNO $**

LOCATION IDENTIFIER:
3 or 4 alphanumeric characters (usually airport identifier).

TYPE OF REPORT:
SA = Scheduled record (hourly) observation.
SP = Special observation indicating a significant change in one or more of the observed elements.
RS = SA that also qualifies as an SP.
USP = Urgent special observation to report tornado.

TIME OF REPORT:
Coordinated Universal Time (UTC or Z) using 24-hr clock.

STATION TYPE:
A02 = Unattended (no observer) ASOS.
A02A = Attended (observer present) ASOS.

SKY CONDITION AND CEILING BELOW 12,000' AGL:
Sky condition contractions are for each layer in ascending order. Numbers preceding contractions are base height in hundreds of feet above ground level (AGL).
CLR BLO 120 = Less than 0.1 sky cover below 12,000'
SCT = Scattered: 0.1 to 0.5 sky cover.
BKN = Broken: 0.6 to 0.9 sky cover.
OVC = Overcast: More than 0.9 sky cover.
A letter preceding the height of a base identifies a ceiling layer and indicates how ceiling height was determined.
M = Measured **W** = Indefinite
E = Estimated **X** = Obscured sky
The letter **V** is added immediately following the height of a base to indicate a variable ceiling: see Remarks.

VISIBILITY:
Reported in statute miles and fractions from <1/4 through 10+. **V** = variable: see Remarks.

PRESENT WEATHER:
TORNADO (when augmented).
T = Thunder (when augmented): see Status Remarks.
R = Liquid precipitation that does not freeze (e.g., rain).
P — = Light precipitation in unknown form.
ZR = Liquid precipitation that freezes on impact (e.g., freezing rain): see Status Remarks.
A = Hail (when augmented).
S = Frozen precipitation other than hail (e.g., snow).
+ = Heavy. No sign = Moderate. **—** = Light.

OBSTRUCTIONS TO VISION :
Reported only when visibility is less than 7 statute miles.
F = Fog **H** = Haze
VOLCANIC ASH (when augmented).

SEA-LEVEL PRESSURE:
Tenths of Hectopascals (millibars). Shown as last 3 digits only without decimal point (e.g., 995.0 = 950).

TEMPERATURE AND DEW POINT:
Degrees Fahrenheit.

WIND DIRECTION, SPEED AND CHARACTER:
Direction in tens of degrees from **true** north. Voice broadcast in degrees from **magnetic**. Speed in knots. **0000** = calm. **E** = estimated. **G** = gusts. **Q** = squalls. Variable wind, peak wind, wind shift: see Remarks.

ALTIMETER SETTING:
Hundredths of inches of mercury. Shown as last 3 digits only without decimal point (e.g., 30.05 inches = 005).

MISSING DATA: Reported as **" M "**.

DENSITY ALTITUDE: Included on voice broadcast only when 1000 or more feet above airport elevation.

REMARKS: Can include
RVR (Runway Visual Range), **VOLCANIC ASH**, **VIRGA**, **TWR VSBY** (Tower visibility), **SFC VSBY** (Surface visibility), **VSBY V** (Variable visibility), **CIG V** (Variable ceiling), **WSHFT** (Windshift), **PK WND** (Peak wind), **WND V** (Variable wind direction), **PCPN** (Precipitation amount), **PRESRR** (Pressure rising rapidly), **PRESFR** (Pressure falling rapidly), **PRJMP** (Pressure jump), **B** (Time weather began), **E** (Time weather ended).

STATUS REMARKS:
PWINO = Precipitation identifier sensor not operational. **ZRNO** = Freezing rain sensor not operational. **TNO** = Thunderstorm information not available. **$** = Maintenance check indicator.

DECODED REPORT: Hometown Municipal Airport, record special observation at 1755 UTC. ASOS with observer. Measured ceiling 1900 feet variable, overcast. Visibility 1 mile, light rain, fog. Sea-level pressure 1012.5 hectopascals, temperature 36°F, dew point 34°F, wind from 210° true at 16 knots gusting to 24 knots, altimeter 29.90 inches. Runway 29L visual range 1000 feet variable to 5000 feet. Ceiling 1600 feet variable to 2200 feet, tower visibility 2 miles, peak wind 200° true at 32 knots at 1732 UTC, pressure falling rapidly. Freezing rain sensor not operational, maintenance check indicator.

NOTE: Refer to *ASOS Guide for Pilots* and the *Airman's Information Manual* for more information. Refer to the *Airport/Facility Directory*, aeronautical charts, and related publications for broadcast, telephone and location data. Check *Notices to Airmen* for ASOS system status.

U.S. DEPARTMENT OF COMMERCE — NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION — NATIONAL WEATHER SERVICE **9/15/92**

PREFLIGHT PREPARATION AND FLIGHT PLAN REQUIREMENTS

1. PREFLIGHT PREPARATION

1.1 Every pilot is urged to receive a preflight briefing and to file a flight plan. This briefing should consist of the latest or most current weather, airport, and en route NAVAID information. Briefing service may be obtained from a Flight Service Station either by telephone/interphone, by radio when airborne, or by a personal visit to the station. In the contiguous 48 States, pilots with a current FAA medical certificate may access toll-free the Direct User Access Terminal System (DUATS) through a personal computer. DUATS will provide alpha-numeric preflight weather data and allow pilots to file domestic VFR and IFR flight plans. (For a list of DUATS vendors, see MET 5.5, FAA WEATHER SERVICES.)

Note—Pilots filing flight plans via "fast file" who desire to have their briefing recorded, should include a statement at the end of the recording as to the source of their weather briefing.

1.2 The information required by the FAA to process flight plans is contained on FAA Form 7233-1, Flight Plan. (See RAC-3 FLIGHT PLAN REQUIREMENTS.) The forms are available at all flight service stations. Additional copies will be provided on request.

1.3 Consult an FSS or Weather Service Office (WSO) for preflight weather briefing. Supplemental Weather Service Locations (SWSLs) do not provide weather briefings.

1.4 FSS's are required to advise of pertinent NOTAM's if a **standard** briefing is requested, but if they are overlooked, don't hesitate to remind the specialist that you have not received NOTAM information. Additionally, NOTAM's which are known in sufficient time for publication and are of 7 days duration or longer are normally incorporated into the Notices to Airmen publication and carried there until cancellation time. FDC NOTAM's, which apply to instrument flight procedures, are also included in Notices to Airmen publication up to and including the number indicated in the FDC NOTAM legend. These NOTAM's are not provided during a briefing unless specifically requested by the pilot since the FSS specialist has no way of knowing whether the pilot has already checked Notices to Airmen publication prior to calling. Remember to ask for NOTAM's contained in the Notices to Airmen publication; they are not normally furnished during your briefing.

1.5 Pilots are urged to use only the latest issue of aeronautical charts in planning and conducting flight operations. Aeronautical charts are revised and reissued on a periodic basis to ensure that depicted data are current and reliable. In the conterminous United States, sectional charts are updated each 6 months, IFR en route charts each 56 days, and amendments to civil IFR approach charts are accomplished on a 56-day cycle with a change notice volume issued on the 28-day mid-cycle. Charts that have been superseded by those of a more recent date may contain obsolete or incomplete flight information.

1.6 When requesting a preflight briefing, identify yourself as a pilot and provide the following:

a. Type of flight planned; e.g., VFR or IFR.

b. Aircraft number or pilot's name.

c. Aircraft type.

d. Departure Airport.

e. Route of flight.

f. Destination.

g. Flight altitude (s).

h. ETD and ETE.

1.7 Prior to conducting a briefing, briefers are required to havethe background information listed above so that they may tailor the briefing to the needs of the proposed flight. The objective is to communicate a "picture" of meteorological and aeronautical information necessary for the conduct of a safe and efficient flight. Briefers use all available weather and aeronautical information to summarize data applicable to the proposed flight. They do not read weather reports and forecasts verbatim unless specifically requested by the pilot. Refer to MET-0 para 5.3.3 for those items of a weather briefing that should be expected or requested.

1.8 The Federal Aviation Administration (FAA) by Federal Aviation Regulation, Part 93, Subpart K, has designated High Density Traffic Airports (HDTA) and has prescribed air traffic rules and requirements for operating aircraft (excluding helicopter operations) to and from these airports (see details in Airport/Facility Directory, Special Notices Section).

1.9 In addition to the filing of a flight plan, if the flightwill traverse or land in one or more foreign countries, it is particularly important that pilots leave a complete itinerary with someone directly concerned, keep that person advised of the flights progress and inform him that, if serious doubt arises as the the safety of the flight, he should first contact the FSS.

1.10 Pilots operating aircraft underthe provisions of an FAR Part 135, ATCO, certificate and not having an FAA assigned 3-letter designator, are urged to prefix the normal aircraft registration (N) number with the letter "T" on flight plan filing.

Example: TN 1234B.

1.11 Follow IFR Procedure Event When Operating VFR

1.11.1 To maintain IFR proficiency, pilots are urged to practiceIFR procedures whenever possible, even when operating VFR. Some suggested practices include:

a. Obtain a complete preflight and weather briefing. Check the NOTAM's.

b. File a flight plan. This is an excellent low cost insurance policy. The cost is the time it takes to fill it out. The insurance includes the knowledge that someone will be looking for you if your become overdue at your destination.

c. Use current charts.

d. Use the navigation aids. Practice maintaining a good course—keep the needle centered.

e. Maintain a constant altitude appropriate for direction of flight.

f. Estimate en route position times.

g. Make accurate and frequent position reports to the FSS's along your route of flight.

1.11.2 Simulated IFR flight is recommended (under the hood); however, pilots are cautioned to review and adhere to the requirements specified in FAR 91.109 before and during such flight.

1.11.3 VFR At Night

When flying VFR at night, in addition to the altitude appropriate for the direction of flight, pilots should maintain an altitude which is at or above the minimum en route altitude as shown on charts. This is especially true in mountainous terrain, where there is usually very little ground reference. Do not depend on your eyes alone to avoid rising unlighted terrain, or even lighted obstructions such as TV towers.

2. DOMESTIC NOTICE TO AIRMEN (NOTAM) SYSTEM

2.1 Time-critical aeronautical information which is of either a temporary nature or is not sufficiently known in advance to permit publication on aeronautical charts or in other operational publications, receives immediate dissemination via the National Notice to Airmen (NOTAM) System.

Note—NOTAM information is that aeronautical information that could affect a pilot's decision to make a flight. It includes such information as airport or primary runway closures, changes in the status of navigational aids, ILS, radar service availability, and other information essential to planned en route, terminal, or landing operations.

2.2 NOTAM information is classified into three categories. These are NOTAM (D) or distant, NOTAM (L) or local, and Flight Data Center (FDC) NOTAM's.

2.2.1 NOTAM (D)

2.2.1.1 NOTAM (D) information is disseminated for all navigational facilities that are part of the National Airspace System (NAS), all public use airports, seaplane bases, and heliports listed in the Airport/Facility Directory (A/FD). The complete file of all NOTAM (D) information is maintained in a computer data base at the National Communications Center (NATCOM), located in Kansas City, Missouri. This category of information is distributed automatically, appended to the hourly weather reports, via the Service A telecommunications system. Air traffic facilities, primarily FSS's, with Service A capability have access to the entire NATCOM data base of NOTAM's. These NOTAM's remain available via Service A for the duration of their validity or until published.

2.2.2 NOTAM (L)

2.2.2.1 NOTAM (L) information includes such data as taxiway closures, personnel and equipment near or crossing runways, airport rotating beacon outages, and airport lighting aids that do not affect instrument approach criteria, such as VASI.

2.2.2.2 NOTAM (L) information is distributed locally only and is not attached to the hourly weather reports. A separate file of local NOTAM's is maintained at each FSS for facilities in their area only. NOTAM (L) information for other FSS areas must be specifically requested directly from the FSS that has responsibility for the airport concerned.

Note—DUATS vendors are not required to provide NOTAM (L) information.

2.2.3 FDC NOTAM's

2.2.3.1 On those occasions when it becomes necessary to disseminate information which is regulatory in nature, the National Flight Data Center (NFDC) in Washington, D.C., will issue an FDC NOTAM. FDC NOTAM's contain such things as amendments to published IAP's and other current aeronautical charts. They are also used to advertise temporary flight restrictions caused by such things as natural disasters or large scale public events that may generate a congestion of air traffic over a site.

2.2.3.2 FDC NOTAM's are transmitted via Service A only once and are kept on file at the FSS until published or canceled. FSS's are responsible for maintaining a file of current, unpublished FDC NOTAM's concerning conditions within 400 miles of their facilities. FDC information concerning conditions that are more than 400 miles from the FSS, or that is already published, is given to a pilot only on request.

Note 1—DUATS vendors will provide FDC NOTAM's only upon site-specific requests using a location identifier.

Note 2—NOTAM data may not always be current due to the changeable nature of the National Airspace System components, delays inherent in processing the information, and occasional temporary outages of the United States NOTAM System. While en route, pilots should contact FSS's and obtain updated information for their route of flight and destination.

2.3 An integral part of the NOTAM System is the biweekly Notice to Airmen publication. Data is included in this publication to reduce congestion on the telecommunications circuits and, therefore, is not available via Service A. Once published, this information is not provided during pilot weather briefings unless specifically requested by the pilot. This publication contains two sections:

2.3.1 The first section consists of notices which meet the criteria for NOTAM (D), and are expected to remain in effect for an extended period, and FDC NOTAM's current at the time of publication. Occasionally, some NOTAM (L) and other unique information is included in this section when it will contribute to flight safety.

2.3.2 The second section contains special notices that are too long or concern a wide or unspecified geographic area and are not suitable for inclusion in the first section. The content of these notices vary widely and there are no specific criteria for their inclusion, other than their enhancement of flight safety.

2.3.3 The number of the last FDC NOTAM included in the publication is noted on the first page to aid the user in updating the listing contained, with any FDC NOTAM's which may have been issued between the cutoff date and the date the publication is received. All information contained will be carried until the information expires, is canceled, or in the case of permanent conditions, is published in other publications, such as the A/FD.

2.3.4 All new notices entered, excluding FDC NOTAM's, will be published only if the information is expected to remain in effect for at least 7 days after the effective date of the publication.

2.4 NOTAM information is not available from a Supplemental Weather Service Location (SWSL).

3. FLIGHT PLAN REQUIREMENTS

Flight plans are required for flights into airspace controlled by an ATC facility. Controlled airspace is defined in RAC 3-4.

(See RAC 3.1, Appendix One for detailed flight plan illustration.) The types of flight plans in U.S. airspace are;

Visual Flight Rules (VFR
Defense Visual Flight Rules (DVFR
Instrument Flight rules (IFR)
Composite Flight Plan Visual-Instrument Flight Rules (VFR-IFR)
IFR flight plans requesting VFR operations

Note—ICAO flight plans are required whenever the flight intends to cross an international boundary or an oceanic CTA/FIR boundary. For flights departing U.S. airports and operate over U.S. domestic airspace and/or offshore control areas, but do not penetrate the oceanic CTA/FIR boundary or borders, a U.S. domestic flight plan is preferred.

3.1 Flight Plan—VFR Flights

3.1.1 Except for operations in or penetrating a Coastal or Domestic ADIZ or DEWIZ (see RAC 8), a flight plan is not required for VFR flight; however, it is strongly recommended that one be filed.

3.1.2 To obtain maximum benefits of the flight plan program, flight plans should be filed directly with the nearest flight service station. for your convenience, FSS's provide one-call (telephone/interphone) or one-stop (personal) aeronautical and meteorological briefings while accepting flight plans. Radio may be used to file if no other means are available. Also, some states operate aeronautical communications facilities which will accept and forward flight plans to the FSS for further handling.

3.1.3 When a "stopover" flight is anticipated to cove an extended period of time, it is recommended that a separate flight plan be filed for each "leg" when the stop is expected to be more than one hour duration.

3.1.4 Pilots are encouraged to give their departure times directly to the flight service station serving the departure airport or as otherwise indicated by the FSS when the flight plan is filed. This will ensure more efficient flight plan service and permit the FSS to advise you of significant changes in aeronautical facilities or meteorological conditions. When a VFR flight plan is filed, it will be held by the FSS until one hour after the proposed departure time and then canceled unless:

a. The actual departure time is received.

b. A revised proposed departure time is received.

c. At a time of filing, the FSS is informed that the proposed departure time will be met, but actual time cannot be given because of inadequate communications (assumed departures).

3.1.5 On pilot's request, at a location having an active tower, the aircraft identification will be forwarded by the tower to the FSS for reporting the actual departure time. This procedure should be avoided at busy airports.

3.1.6 Although position reports are not required for VFR flight plans, periodic reports to FAA Flight Service Stations along the route are good practice. Such contacts permit significant information to be passed to the transiting aircraft and also serve to check the progress of the flight should it be necessary for any reason to locate the aircraft.

Example 1:
Bonanza 31K, over Kingfisher at (time), VFR flight plan, Tulsa to Amarillo.

Example 2:
Cherokee 5123J, over Oklahoma city at (time), Shreveport to Denver, no flight plan.

3.1.7 Pilots not operating on an IFR flight plan, and when in level cruising flight, are cautioned to conform with VFR cruising altitudes appropriate to direction of flight.

3.1.8 Indicate aircraft equipment capabilities when filing VFR flight plans by appending the appropriate suffix to aircraft type in the same manner as that prescribed for IFR flight (see FLIGHT PLAN-IFR FLIGHTS 3.3.5.1 Block 3). Under some circumstances, ATC computer tapes can be useful in constructing the radar history of a downed or crashed aircraft. In each case, knowledge of the aircraft's transponder equipment is necessary in determining whether or not such computer tapes might prove effective.

3.1.9 *Flight Plan Form*

Form Approved OMB No 2120-0026

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION **FLIGHT PLAN**	(FAA USE ONLY) ☐ PILOT BRIEFING ☐ VNR ☐ STOPOVER	TIME STARTED	SPECIALIST INITIALS

1 TYPE	2 AIRCRAFT IDENTIFICATION	3 AIRCRAFT TYPE/ SPECIAL EQUIPMENT	4 TRUE AIRSPEED	5 DEPARTURE POINT	6 DEPARTURE TIME		7 CRUISING ALTITUDE
VFR / IFR / DVFR			KTS		PROPOSED (Z)	ACTUAL (Z)	

8 ROUTE OF FLIGHT

9 DESTINATION (Name of airport and city)	10 EST TIME ENROUTE HOURS	MINUTES	11 REMARKS

12 FUEL ON BOARD HOURS	MINUTES	13 ALTERNATE AIRPORT(S)	14 PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE	15 NUMBER ABOARD
			17 DESTINATION CONTACT/TELEPHONE (OPTIONAL)	

16 COLOR OF AIRCRAFT	CIVIL AIRCRAFT PILOTS: FAR Part 91 requires you file an IFR flight plan to operate under instrument flight rules in controlled airspace. Failure to file could result in a civil penalty not to exceed $1,000 for each violation (Section 901 of the Federal Aviation Act of 1958, as amended). Filing of a VFR flight plan is recommended as a good operating practice. See also Part 99 for requirements concerning DVFR flight plans

FAA Form 7233-1 (8-82) CLOSE VFR FLIGHT PLAN WITH _____ FSS ON ARRIVAL

3.1.10 *Explanation of VFR Flight plan items*

Block 1. Check the type flight plan. Check both the VFR and IFR blocks if composite VFR/IFR.

Block 2. Enter your complete aircraft identification including the prefix "N" if applicable.

Block 3. Enter the designator for the aircraft or, if unknown, the aircraft manufacturer's name.

Block 4. Enter your true airspeed (TAS).

Block 5. Enter the departure airport identifier code (or the name if identifier is unknown).

Block 6. Enter the proposed departure time in Coordinated Universal Time (UTC). If airborne, specify the actual or proposed departure time as appropriate.

Block 7. Enter the appropriate VFR altitude (to assist the briefer in providing weather/wind information).

Block 8. Define the route of flight by using NAVAID identifier codes and airways.

Block 9. Enter the destination airport identifier code (or name if identifier is unknown). Include the city name (or even the state name) if needed for clarity.

Block 10. Enter your estimated time en route, in hours and minutes.

Block 11. Enter only those remarks pertinent to ATC or to the clarification of other flight plan information such as the appropriate radiotelephony (call sign) associated with the designator filled in Block 2. Items of a personal nature are not accepted.

Block 12. Specify the fuel on board, in hours and minutes.

Block 13. Specify an alternate airport if desired.

Block 14. Enter your complete name, address, and telephone number. Enter sufficient information to identify home base, airport, or operator. This information is essential in the event of search and rescue operations.

Block 15. Enter total number of persons on board including crew (POB).

Block 16. Enter the predominant color(s).

Block 17. Record the FSS name for closing the flight plan. If the flight plan is closed with a different FSS or a Air Traffic facility, state the recorded FSS name that would normally have closed your flight plan. **(Optional)**—Record a destination telephone number to assist Search and Rescue contact should you fail to report or cancel your flight plan within 1/2 hour after your estimated time of arrival (ETA). *Caution: A control tower at destination point does not automatically close VFR flight plans, it remains the responsibility of a pilot to close his own flight plan.*

Note—The information transmitted to the destination FSS will consist only of flight plans blocks 2,3,9, and 10. Estimated time en route (ETE) will be converted to the correct estimated time of arrival (ETA).

3.2 Flight Plan—Defense VFR (DVFR) FLIGHTS

VFR flights into a Coastal or Domestic ADIZ/DEWIZ are required to file DVFR flight plans for security purposes. Detailed ADIZ procedures are found in RAC 8. (See Far 99.)

3.3 Flight Plan—IFR Flights

3.3.1 *General*

3.3.1.1 Prior to departure from within, or prior to entering controlled airspace, a pilot must submit a complete flight plan and receive an air traffic clearance if weather conditions are below

AIRSPACE

1. GENERAL

Airspace users' operations and needs are varied. Because of the nature of some operations, restrictions must be placed upon others for safety reasons. The complexity or density of aircraft movements in other airspace areas may result in additional aircraft and pilot requirements for operation within such airspace. It is of the utmost importance that pilots be familiar with the operational requirements for the various airspace segments.

2. UNCONTROLLED AIRSPACE

Uncontrolled airspace is that portion of the airspace that has not been designated as a Control Zone, Airport Radar Service Area, Terminal Control Area, Transition Area, Control Area, Continental Control Area, or Positive Control Area..

2.1 Rules Pertaining to VFR Aircraft in Uncontrolled Airspace

Rules governing VFR flight (FAR 91.155) have been adopted to assist the pilot in meeting his responsibility to see and avoid other aircraft. Minimum weather conditions and distance from clouds required for VFR flight are contained in these rules. (See RAC 3.4, Appendix One for a tabular presentation of these rules.)

2.2 Rules Pertaining to IFR Aircraft in Uncontrolled Airspace

Federal Aviation Regulations specify the pilot and aircraft equipment requirements for IFR flight. Pilots are reminded that in addition to the altitude/flight level indicated, FAR 91.177 includes a requirement to remain at least 1,000 feet (2,000 feet in designated mountainous terrain) above the highest obstacle within a horizontal distance of 4 nautical miles from the course to be flown. The appropriate altitude/flight level for IFR flight in uncontrolled airspace is presented in tabular form in RAC 3.4, Appendix One.

3. CONTROLLED AIRSPACE

3.1 Controlled airspace consists of those areas designated as Continental Control Area, Control Area, Positive Control Area, Control Zones, Terminal Control Areas, Airport Radar Service Area and Transition Areas, within which some or all aircraft may be subject to Air Traffic Control. Safety, users' needs, and volume of flight operations are some of the factors considered in the designation of controlled airspace. When so designated, the airspace is supported by ground/air communications, navigation aids, and air traffic services

3.1.1 Continental Control Area

The Continental Control Area consists of the airspace of the 48 contiguous States, the District of Columbia and Alaska, excluding the Alaska peninsula west of Longitude 160°00'00''W, at and above 14,500 feet MSL, but does not include:

3.1.1.1 The airspace less than 1,500 feet above the surface of the earth; or

3.1.1.2 Prohibited and Restricted Areas, other than the Restricted Areas listed in FAR Part 71, Subpart D.

3.1.2 Control Areas

Control Areas consist of the airspace designated as Colored Federal airways, VOR Federal airways, Additional Control Areas, and Control Area Extensions, but do not include the Continental Control Area. Unless otherwise designated, control areas also include the airspace between a segment of a main VOR airway and its associated alternate segments. The vertical extent of the various categories of airspace contained in control area is defined in FAR Part 71.

3.1.3 Positive Control Area

Positive control Area is airspace so designated in Part 71.193 of the Federal Aviation Regulations. This area includes specified airspace within the conterminous United States from 18,000 feet to and including FL600, excluding Santa Barbara Island, Farallon Island, and that portion south of latitude 25°04'N. In Alaska, it includes the airspace over the State of Alaska from 18,000 feet to and including FL600, but not including the airspace less than 1,500 feet above the surface of the earth and the Alaskan Peninsula west of longitude 160°00'W. Rules for operating in Positive Control Area are found in FAR's 91.135 and 91.215.

3.1.4 Transition Areas

3.1.4.1 Transition Areas are designated to contain IFR operations in controlled airspace during portions of the terminal operation and while transitioning between the terminal and en route environment.

3.1.4.2 Transition Areas are controlled airspace upward from 700 feet or more above the surface when designated in conjunction with an airport for which an instrument approach procedure has been prescribed; or from 1,200 feet or more above the surface when designated in conjunction with airway route structures or segments. Unless specified otherwise, transition areas terminate at the base of overlying controlled airspace.

3.1.5 Control Zones

3.1.5.1 Control Zones are regulatory in nature and established as controlled airspace. They extend upward from the surface and terminate at the base of the Continental Control Area. Control Zones that do not underlie the Continental Control Area have no upper limit. A Control Zone is based on a primary airport but may include one or more airports and is normally a circular area within a radius of 5 statute miles around the primary airport, except that it may include extensions necessary to include instrument departure and arrival paths.

3.1.5.2 Some basic requirements for designating a control zone are communications and weather observation reporting:

3.1.5.2.1 Communications capability with aircraft which normally operate within the control zone must exist down to the runway surface of the primary airport. Communications may be either direct from the ATC facility having jurisdiction over the control zone or by rapid relay through other communications facilities which are acceptable to that ATC facility.

3.1.5.2.2 Federally certificated weather observers take hourly and special weather observations at the primary airport in the control zone during the times and dates a control zone is designated. The required weather observations must be forwarded expeditiously to the ATC facility having jurisdiction over the control zones.

3.1.5.3 Control Zones with an operating control tower are depicted on charts by a segmented blue line, and Control Zones without an operating control tower are depicted on charts by a segmented magenta line. If a Control Zone is effective only during certain hours of the day (a part-time Control Zone as prescribed in the regulation), it will be reflected on the charts. A typical Control Zone is depicted in RAC 3.4, Appendix Two. (See RAC 3.3, Special VFR Clearance.)

3.1.6 Terminal Control Areas

3.1.6.1 A Terminal Control Area (TCA) consists of controlled airspace extending upward from the surface or higher to specified altitudes, within which all aircraft are subject to the operating rules and pilot/equipment requirements specified in Part 91 of the FAR. Each TCA location includes at least one primary airport around which the TCA is located. Descriptions of TCA's can be found in Part 71 of the FAR.

3.1.6.2. Terminal Control Areas are charted on Sectional, World Aeronautical, En Route Low Altitude, DOD FLIP and Terminal Area Charts, at the following locations:

Atlanta	Kansas City	Phoenix
Boston	Las Vegas	Pittsburgh
Charlotte	Los Angeles	St. Louis
Chicago	Memphis	Salt Lake City
Cleveland	Miami	San Diego
Dallas	Minneapolis	San Francisco
Denver	New Orleans	Seattle
Detroit	New York	Tampa
Honolulu	Orlando	Washington, DC
Houston	Philadelphia	

3.1.6.3 Operations Reservations For High Density Traffic Airports

The Federal Aviation Administration by Federal Aviation Regulations, Part 93, Subpart K, has designated high density traffic airports (HDTA's) and has prescribed air traffic rules and requirements for operating aircraft (excluding helicopter operations) to and from these airports.

3.1.6.3.1 IFR reservations are required for the following HDTAs, both for arrivals and departures: New York, La Guardia Airport; New York, Kennedy Airport; Chicago, O'Hare Airport; Washington, D.C., National Airport. Reservations for Kennedy Airport are required between the hours of 3:00 p.m. through 7:59 p.m. local and for O'Hare Airport from 6:45 a.m. to 9:15 p.m. local time. Reservations for La Guardia and Washington National Airports are required between the hours of 6 a.m. and midnight local time.

3.1.6.3.2 To obtain your IFR reservation, contact your nearest flight service station or call the Airport Reservation Office (ARO) at the following toll free number: 1-800-322-1212. For telephones without Touch-Tone service, the number is (202) 267-5312.

3.1.6.3.3 Requests for a reservation will be accepted any time after 6 a.m. local time on the day which is 48 hours in advance of the proposed operation.

3.1.6.3.4 Aircraft involved in medical emergencies will be handled within the ATC system without regard to obtaining a reservation.

3.2 Rules Pertaining to IFR Aircraft in Controlled Airspace

Pilots operating IFR within controlled airspace will fly at an altitude/flight level assigned by ATC. When operating IFR within controlled airspace with an altitude assignment of "VFR-ON-TOP," flight is to be conducted at an appropriate VFR altitude which is not below the minimum IFR altitude for the route (See RAC 3.4, Appendix One). (FAR 91.179) VFR-ON-TOP is not permitted in certain airspace, such as positive control airspace, certain Restricted Areas, etc. Consequently, IFR flights operating VFR-ON-TOP will avoid such airspace.

3.3 Airport Radar Service Area (ARSA)

3.3.1 An Airport Radar Service Area (ARSA) consists of controlled airspace extending upward from the surface or higher to specified altitudes, within which all aircraft are subject to the operating rules and pilot and equipment requirements specified in FAR 91. ARSA's are described in FAR 71. (See FAR 71.14).

3.3.2 Dimensions

3.3.2.1 ARSA (A basic standard design with minor site specific variations.) The ARSA airspace consists of two circles, both centered on the primary/ARSA airport. The inner circle has a radius of 5 nm. The outer circle has a radius of 10 nm. The airspace of the inner cirlce extends from the surface of the ARSA upto 4,000 feet above that airport. The airspace area between the 5 and 10 nm rings begins at a height 1,200 feet AGL and extends to the same altitude cap as the inner circle.

3.3.2.2 Outer Area

The normal radius will be 20NM with some variations based on site specific requirements. The outer area extends outward from the primary/ARSA airport and extends from the lower limits of radar/radio coverage up to the ceiling of the approach control's delegated airspace, excluding the ARSA and other airspace as appropriate.

3.3.3 ARSA's are charted on Sectional Charts and on some Terminal Control Area Charts.

3.3.4 Operating Rules and Pilot/Equipment Requirements

3.3.4.1 Pilot Certification: No specific certification required.

3.3.4.2 Equipment: Two-Way Radio and, a Mode C or Mode S Transponder. See RAC 1-3, paragraph 3.1.6.3 for additional information.

3.3.4.3 Arrivals and Transitions: Two-way radio communication must be established with the ATC facility having jurisdiction over the ARSA prior to entry and thereafter as instructed by ATC.

3.3.4.4 Departures

3.3.4.4.1 Primary or Satellite Airport with an Operating Control Tower: Two-way radio communication must be established and maintained with the control tower in accordance with FAR 91.129 and thereafter as instructed by ATC.

3.3.4.4.2 Satellite Airport without an Operating Control Tower: Two-way radio communication must be established as soon as practicable after departing with the ATC facility having jurisdiction over the ARSA and thereafter, as instructed by ATC.

3.3.4.5 Traffic Patterns: Pilots must comply with FAA arrival or departure traffic patterns.

3.3.4.6 Ultralight Vehicles: Ultralight vehicle operations are not permitted in an ARSA unless otherwise authorized by the air traffic control facility having jurisdiction over the ARSA. (FAR 103)

3.3.4.7 Parachute Jumps: Parachute jumps are not permitted in an ARSA except under the terms of an ATC authorization issued by the ATC facility having jurisdiction over the ARSA. (FAR 105)

3.3.5 ATC Services

3.3.5.1 Within the ARSA:

3.3.5.1.1 Sequencing of all arriving aircraft to the primary/ ARSA airport.

3.3.5.1.2 Standard IFR separation between IFR aircraft.

3.3.5.1.3 Between IFR and VFR aircraft—Traffic advisories and conflict resolution so that radar targets do not touch or 500 feet vertical separation.

3.3.5.1.4 Between VFR aircraft—Traffic advisories and, as appropriate, safety alerts.

3.3.5.2 Within the Outer Area:

3.3.5.2.1 The same services are provided for aircraft operating within the outer area as within the ARSA when two-way communication and radar contact is established.

3.3.5.2.2 While pilot participation in this area is strongly encouraged, it is not a VFR requirement.

3.3.5.3 Beyond the Outer Area:

3.3.5.3.1 Standard IFR separation.

3.3.5.3.2 Basic radar service.

3.3.5.3.3 Stage II/Stage III service where appropriate.

3.3.5.3.4 Safety alerts as appropriate.

3.3.6 Air traffic control radar is required to provide ARSA services. ARSA services may not be available or may be limited during radar outages.

3.3.6.1 Separation and sequencing of visual flight rules (VFR) aircraft will be suspended during a radar outage. The pilot will be advised that ARSA service is not available and issued wind, runway information and the time or location to contact the tower.

3.3.6.2 Separation of VFR aircraft will be suspended during Center Radar ARTS Presentation/Processing (CENRAP) operations. Traffic advisories and sequencing to the primary airport will be provided on a workload permitting basis. The pilot will be advised when CENRAP is in use.3.3.7 While pilot participation is required within the ARSA, it is voluntary within the outer area and can be discontinued within the outer area at pilot request.

3.3.8 ARSA services will be provided in the outer area unless the pilot requests termination of the service.

3.3.9 Service provided beyond the outer area will be on a workload permitting basis and can be terminated by the controller if workload dictates.

3.3.10 In some locations, an ARSA may overlap the airport traffic area of a secondary airport. In order to allow that control tower to provide service to aircraft, portions of the overlapping ARSA may be procedurally excluded when the secondary airport tower is in operation. Aircraft operating in these procedurally excluded areas will only be provided airport traffic control services when in communication with the secondary airport tower. ARSA service to aircraft inbound to these airports will be discontinued when the aircraft is instructed to contact the tower.

3.3.11 Aircraft departing secondary controlled airports will not receive ARSA service until they have been radar identified and two-way communication has been established with the ARSA facility.

3.3.12 ARSA service to aircraft proceeding to a satellite airport will be terminated at a sufficient distance to allow time to change to the appropriate tower or advisory frequency.

3.3.13 Some ARSA facilities shut down for portions of the night. When this occurs, the effective hours of the ARSA will be the same as the operating hours of the serving facility.

3.3.14 This program is not to be interpreted as relieving pilots of their responsibilities to see and avoid other traffic operating in basic VFR weather conditions, to adjust their operations and flight paths as necessary to preclude serious wake encounters, to maintain appropriate terrain and obstruction clearance, or to remain in weather conditions equal to or better than the minimums required by FAR 91.155. Whenever compliance with an assigned route, heading, and/or altitude is likely to compromise pilot responsibility respecting terrain and obstruction clearance, vortex exposure, and weather minimums, approach control should be so advised and a revised clearance or instruction obtained.

3.3.15 Pilots of arriving aircraft should contact the ARSA facility on the publicized frequency and give their position, altitude, radar beacon code (if transponder equipped), destination, and request ARSA services. Radio contact should be initiated far enough from the ARSA boundary to preclude entering the ARSA before radio communication is established.

3.3.16 If the controller responds to a radio call with, "(aircraft call sign) standby," radio communications have been established and the pilot can enter the ARSA. If workload or traffic conditions prevent immediate provision of ARSA services, the controller will inform the pilot to remain outside the ARSA until conditions permit the services to be provided.

Example:

"(Aircraft call sign) remain outside the ARSA and standby."

Note. — It is important to understand that if the controller responds to the initial radio call without using the aircraft call sign, radio communications have **not** been established, and the pilot may not enter the ARSA.

Example:

"Aircraft calling Dulles Approach Control standby."

3.4 Rules Pertaining to Aircraft Operating in Terminal Control Areas (TCA)

3.4.1 Operating Rules and Pilot/Equipment Requirements

REGARDLESS OF WEATHER CONDITIONS, AN ATC AUTHORIZATION IS REQUIRED PRIOR TO OPERATING WITHIN A TCA. Pilots should not request an authorization to operate within a TCA unless the requirements of FAR 91.215 and FAR 91.131 are met. Included among these requirements are:

3.4.1.1 Unless otherwise authorized by ATC, aircraft must be equipped with an operable two-way radio capable of communicating with ATC on appropriate frequencies for that terminal control area.

3.4.1.2 No person may takeoff or land a civil aircraft at an airport within a TCA or operate a civil aircraft within a TCA unless:

3.4.1.2.1 The pilot-in-command holds at least a private pilot certificate; or

3.4.1.2.2 The aircraft is operated by a student pilot who has met the requirements of FAR 61.95; however,

3.4.1.3 The following TCA primary airports, no person may takeoff or land a civil aircraft unless the pilot-in-command holds **at least** a private pilot certificate:

Atlanta Hartsfield Airport, GA
Boston Logan Airport, MA
Chicago O'Hare International Airport, IL
Dallas/Fort Worth International Airport, TX
Los Angeles International Airport, CA
Miami International Airport, FL
Newark International Airport, NJ
New York Kennedy Airport, NY
New York La Guardia Airport, NY
San Francisco International Airport, CA
Washington National Airport, DC
Andrews Air Force Base, MD (Washington, DC)

3.4.1.4 Unless otherwise authorized by ATC, each person operating a large turbine engine-powered airplane to or from a primary airport shall operate at or above the designated floors while within the lateral limits of the TCA.

3.4.1.5 Unless otherwise authorized by ATC, each aircraft must be equipped as follows:

3.4.1.5.1 A two-way radio capable of communications with ATC on appropriate frequencies for that area.

3.4.1.5.2 For IFR operations, an operable VOR or TACAN receiver.

3.4.1.5.3 Unless otherwise authorized by ATC, an operable radar beacon transponder with automatic altitude reporting equipment.

3.4.1.5.4 Unless otherwise authorized by ATC, aircraft must be equipped with a 4096 code transponder with automatic altitude reporting equipment.

Note. — ATC may, upon notification, immediately authorize a deviation from the altitude reporting equipment requirement; however, a request for a deviation from the 4096 transponder equipment requirement must be submitted to the controlling ATC facility at least 1 hour before the proposed operation. (See RAC 1, RADAR APPLICATION.)

3.4.2 Flight Procedures

3.4.2.1 IFR Flights

Aircraft within the TCA are required to operate in accordance with current IFR procedures. A clearance for a visual approach to a primary airport is not authorization for turbine-powered airplanes to operate below the designated floors of the TCA.

3.4.2.2 VFR Flights

3.4.2.2.1 ARRIVING AIRCRAFT MUST OBTAIN AUTHORIZATION PRIOR TO ENTERING A TCA AND MUST CONTACT ATC ON THE APPROPRIATE FREQUENCY, and in relation to geographical fixes shown on local charts. Although a pilot may be operating beneath the floor of the TCA on initial contact, communications with ATC should be established in relation to the points indicated for spacing and sequencing purposes

3.4.2.2.2 Departing aircraft require a clearance to depart the TCA and should advise the clearance delivery position of their intended altitude and route of flight. ATC will normally advise VFR aircraft when leaving the geographical limits of the TCA. Radar service is not automatically terminated with this advisory unless specifically stated by the controller.

3.4.2.2.3 Aircraft not landing or departing the primary airport may obtain ATC clearance to transit when traffic conditions permit and provided the requirements of FAR 91.131 are met. Such VFR aircraft are encouraged, to the extent possible, to operate at altitudes above or below the TCA or transit through established VFR corridors. Pilots operating in VFR corridors are urged to use frequency 122.750 MHz for the exchange of aircraft position information.

3.4.2.2.4 VFR non-TCA aircraft are cautioned against operating too closely to TCA boundaries, especially where the floor of the TCA is 3,000 feet or less or where VFR cruise altitudes are at or near the floor of higher levels. Observance of this precaution will reduce the potential for encountering a TCA aircraft operating at TCA floor altitudes. Additionally, VFR non-TCA aircraft are encouraged to utilize the VFR Planning Chart as a tool for planning flight in proximity to a TCA. Charted VFR Flyway Planning charts are published on the back of the existing VFR Terminal Area Charts.

3.4.3 ATC Clearances and Separations

AN ATC AUTHORIZATION IS REQUIRED TO ENTER AND OPERATE WITHIN A TCA. VFR pilots are provided sequencing and separation from other aircraft while operating within a TCA. (See RAC-1 TERMINAL RADAR PROGRAMS for VFR AIRCRAFT.)

Note 1. — Separation and sequencing of visual flight rules (VFR) aircraft will be suspended in the event of a radar outage as this service is dependent on radar. The pilot will be advised that the service is not available and issued wind, runway information and the time or place to contact the tower.

Note 2. — Separation of VFR aircraft will be suspended during Center Radar ARTS Presentation/Processing (CENRAP) operations. Traffic advisories and sequencing to the primary airport will be provided on a workload permitting basis. The pilot will be advised when CENRAP is in use.

3.4.3.1 VFR aircraft are separated from all VFR/IFR aircraft which weigh 19,000 pounds or less by a minimum of:

3.4.3.1.1 Target resolution, or

3.4.3.1.2 500 feet vertical separation, or

3.4.3.1.3 Visual separation.

5.1.1.1 When vacating any previously assigned altitude/flight level for a newly assigned altitude/flight level.

5.1.1.2 When an altitude change will be made if operating on a clearance specifying "VFR ON TOP."

5.1.1.3 When unable to climb/descend at a rate of at least 500 feet per minute.

5.1.1.4 When approach has been missed. (Request clearance for specific action; i.e., to alternative airport, another approach, etc.)

5.1.1.5 Change in the average true airspeed (at cruising altitude) when it varies by 5 percent or 10 knots (whichever is greater) from that filed in the flight plan.

5.1.1.6 The time and altitude/flight level reaching a holding fix or point to which cleared.

5.1.1.7 When leaving any assigned holding fix or point.

Note—The reports in paragraphs 5.1.1.6 and 5.1.1.7 may be omitted by pilots of aircraft involved in instrument training at military area facilities when radar service is being provided.

5.1.1.8 Any loss, in controlled airspace, of VOR, TACAN, ADF, low frequency navigation receiver capability, complete or partial loss of ILS receiver capability or impairment of air/ground communications capability. Reports should include aircraft identification, equipment affected, degree to which the capability to operate under IFR in the ATC system is impaired, and the nature and extent of assistance desired from ATC.

Note—Other equipment installed in an aircraft may effectively impair safety and/or the ability to operate under IFR. If such equipment; e.g. airborne weather radar, malfunctions and in the pilot's judgment either safety or IFR capabilities are affected, reports should be made as above.

5.1.1.9 Any information relating to the safety of flight.

5.1.2 When not in "radar contact";

5.1.2.1 When leaving final approach fix inbound on final approach (non precision approach) or when leaving the outer marker or fix used in lieu of the outer marker inbound on final approach (precision approach).

5.1.2.2 A corrected estimate at any time it becomes apparent that an estimate as previously submitted is in error in excess of 3 minutes.

5.2 Pilots encountering weather conditions which have not been forecast, or hazardous condition which have been forecast, are expected to forward a report of such weather to ATC.

6. AIRWAYS AND ROUTE SYSTEMS

Two fixed route systems are established for air navigation purposes. They are the VOR and L/MF system and the jet route system. To the extent possible, these route systems are aligned in an overlying manner to facilitate transition between each.

6.1 VOR and L/MF system

The VOR and L/MF (nondirectional radio beacons) Airway System consists of airways designated from 1,200 feet above the surface (or in some instances higher) up to but not including 18,000 feet MSL. These airways are depicted on En Route Low Altitude Charts.

Note—The altitude limits of a Victor airway should not be exceeded except to effect transition within or between route structures.

6.1.1 Except in Alaska and coastal North Carolina, the VOR Airways are predicated solely on VOR or VORTAC navigation aids; are depicted in blue on aeronautical charts; and are identified by a "V" ("Victor") followed by the airway number; e.g., V 12.

Note—Segments of VOR airways in Alaska and North Carolina (V56, V290) are based on L/MF navigation aids and charted in brown instead of blue on en route charts.

6.1.1.1 A segment of an airway which is common to two or more routes carries the numbers of all the airways which coincide for that segment. When such is the case, a pilot in filing a flight plan needs to indicate only that airway number of the route which he is using.

Note—A pilot who intends to make an airway flight, using VOR facilities, will simply specify the appropriate "Victor" airway(s) in his flight plan. For example, if a flight is to be made from Chicago to New Orleans at 8,000 feet using omniranges only. The route may be indicated as "Departing from Chicago-Midway, cruising 8,000 feet via Victor 9 to Moisant International." If flight is to be conducted in part by means of L/MF navigation aids and in part on omniranges, specifications of the appropriate airways in the flight plan will indicate which types of facilities will be used along the described routes, and, for IFR flight, permit ATC to issue a traffic clearance accordingly. A route may also be described by specifying the station over which the flight will pass but in this case since many VOR's and L/MF aids have the same name, the pilot must be careful to indicate which aid will be used at a particular location. This will be indicated in the route of flight portion of the flight plan by specifying the type of facility to be used after the location name in the following manner: Newark L/MF, Allentown VOR.

6.1.1.2 With respect to position reporting, reporting points are designed for VOR Airway Systems. Flights using Victor Airways will report over these points unless advised otherwise by ATC.

6.1.2 The L/MF airways (colored airways) are predicated solely on L/MF navigation aids and are depicted in brown on aeronautical charts and are identified by color name and number; e.g., Amber One. Green and Red airways are plotted east and west. Amber and Blue airways are plotted north and south.

Note—Except for G13 in North Carolina, the colored airway system exists only in the State of Alaska. All other such airways formerly so designated in the conterminous United States have been rescinded.

CAUTION: Use of Adjacently Located LF/VHF Airways and Routes - Many locations just outside the contiguous 48 states have two separate airway structures. One structure is made up from VOR's and the other from L/MF NAVAID's (nondirectional radio beacons). In some instances, the different routes appear to overlie each other. The NAVAID's are sometimes depicted so close to each other that they will have the appearance of being collocated, or nearly so. Substituting a VOR radial for a nondirectional radio beacon bearing could, in many circumstances, cause an excessive "off course" navigational error. Strict adherence to the color coding of the route structure and NAVAID in use should be maintained. Chart procedures provide an excellent means of route differentiation through the use of color which is defined and explained in the legend.

6.2 Jet Route System

6.2.1 The jet route system consists of jet routes established from 18,000 feet MSL to FL 450 inclusive.

6.2.2 These routes are depicted on En Route High Altitude Charts. Jet routes are depicted in black on aeronautical charts and are identified by a "J" (Jet) followed by the airway num-

ber; e.g., J 12. Jet routes, as VOR airways, are predicated solely on VOR or VORTAC navigation facilities (except in Alaska).

Note—Segments of jet routes in Alaska are based on L/MF navigation aids and are charted in brown color instead of black on en route charts.

6.2.3 With respect to position reporting, reporting points are designated for Jet Route Systems. Flights using Jet Routes will report over these points unless otherwise advised by ATC.

6.3 Area Navigation (RNAV) Routes

6.3.1 RNAV is a method of navigation that permits aircraft operations on any desired course within the coverage of station referenced navigation signals or within the limits of a self-contained system capability or combination of these.

6.3.2 Fixed RNAV routes are permanent, published routes which can be flight planned for use by aircraft with RNAV capability. A previously established fixed RNAV route system has been terminated except for a few high altitude routes in Alaska.

6.3.3 Random RNAV routes are direct routes, based on area navigation capability, between waypoints defined in terms of latitude/longitude coordinates, degree-distance fixes, or offsets from established routes/airways at a specified distance and direction. Radar monitoring by ATC is required on all random RNAV routes.

6.4 Radar Vectors

Controllers may vector aircraft within controlled airspace for separation purposes, noise abatement considerations, when an operational advantage will be realize by the pilot or the controller, or when requested by the pilot. Vectors outside of controlled airspace will be provided only on pilot request. Pilots will be advised as to what the vector is to achieve when the vector is controller initiated and will take the aircraft off a previously assigned nonradar route. To the extent possible, aircraft operating on RNAV routes will be allowed to remain on their own navigation.

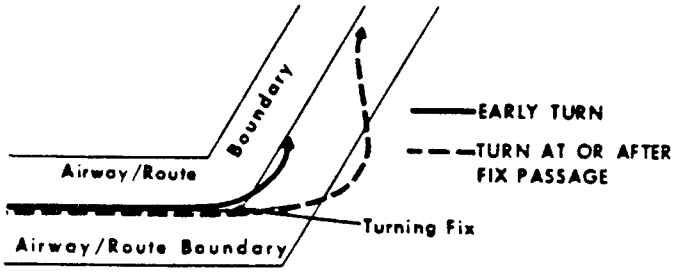
7. AIRWAY CHANGEOVER POINTS (COP)

COP's are prescribed for Federal airways, jet routes, area navigation routes, or other direct routes for which an MEA is designated under Part 95, FAR. The COP is a point along the route or airway segment between two adjacent navigation facilities or way points where changeover navigation guidance should occur. At this point, the pilot should change navigation receiver frequency from the station behind the aircraft to the Station ahead. The COP is located midway between the navigation facilities for straight route segments, or at the intersection of radials or courses forming a dogleg in the case of dogleg route segments. When the COP is NOT located at the midway point, aeronautical charts will depict the COP location and give the mileage to the radio aids. COP's are established for the purpose of preventing loss of navigation guidance, to prevent frequency interference from other facilities, and to prevent use of different facilities by different aircraft in the same airspace. Pilots are urged to observe COP's to the fullest extent.

8. AIRWAY ROUTE COURSE CHANGES

8.1 Pilots of aircraft are required to adhere to airways/routes being flown. Special attention must be given to this requirement during course changes. Each course change consists of variables that make the technique applicable in each case a matter only the pilot can resolve. Some variables which must be considered are turn radius, wind effect, airspeed, degree of turn, and cockpit instrumentation. An early turn, as illustrated below, is one method of adhering to airways/routes. The use of any available cockpit instrumentation, such as distance measuring equipment, may be used by the pilot to lead his turn when making course changes. This is consistent with the intent of FAR 91.181 which requires pilots to operate along the centerline of an airway and along the direct course between navigational aids or fixes.

8.2 Turns which begin at or after fix passage may exceed airway/route boundaries. The following illustration contains an example flight track depicting this, together with an example of an early turn.



8.3 Without such actions, as leading a turn, aircraft operating in excess of 290 knots true airspeed (TAS) can exceed the normal airway/route boundaries depending on the amount of course change required, wind direction and velocity, the character of the turn fix, (DME, overhead navigation aid, or intersection), and the pilot's technique in making a course change. For example, a flight operating at 17,000 feet MSL with a TAS of 400 knots, a 25 degree bank, and a course change of more than 40 degrees would exceed the width of the airway/route; i.e., 4 nautical miles each side of centerline. However, in the airspace below 18,000 feet MSL, operations in excess of 290 knots TAS are not prevalent and the provision of additional IFR separation in all course change situations for the occasional aircraft making a turn in excess of 290 knots TAS creates an unacceptable waste of airspace and imposes a penalty upon the preponderance of traffic which operate at low speeds. Consequently, the FAA expects pilots to lead turns and take other actions they consider necessary during the course changes to adhere as closely as possible to the airways/route being flown.

8.4 Due to the high airspeeds used at 18,000 feet MSL and above, FAA provides additional IFR separation protection for course changes made at such altitude levels.

9. QUOTA FLOW CONTROL

Quota Flow Control is designed to balance the air traffic control system demand with system capacity.

9.1 ARTCC's will hold the optimum number of aircraft that their primary and secondary holding fixes will safely accommodate without imposing undue limitations on the control of other

traffic operating within the ARTCC's airspace. This is based on user requirement to continue operating to a terminal regardless of the acceptance rate at that terminal. When staffing, equipment or severe weather will inhibit the number of aircraft the arrival ARTCC may safely hold, a reduction may be necessary.

9.2 When an ARTCC is holding the optimum number of aircraft, the adjacent ARTCC's will be issued quotas concerning aircraft which can be cleared into the impacted ARTCC AIRSPACE. When the adjacent centers demand exceeds the quota, aircraft will be held in the adjacent ARTCC's airspace until they can be permitted to proceed.

9.3 The size of the hourly quota will be based initially on the projected acceptance rate and thereafter on the actual landing and diversion totals. Once quotas have been imposed, departures in the arrival and adjacent ARTCC's area to the affected airport may be assigned ground delay, if necessary to limit airborne holding to ATC capacity. However, when a forecast of improved acceptance rate appears reliable, in the opinion of the arrival ARTCC, additional above quota flights may be approved based on the expectation that by the time these additional above quota flights become an operational factor in the affected area, the system will be able to absorb them without undue difficulty.

9.4 Long distance flights, which originate beyond the adjacent ARTCC area, will normally be permitted to proceed to a point just short of the arrival ARTCC boundary where a delay, at least equal to the delays (ground/airborne) being encountered will be assigned.

9.5 ARTCC's imposing ground delays make efforts to advise the users when lengthy delays are a prospect to preclude unnecessary boarding and subsequent unloading prior to actual takeoff due to lengthy unanticipated ground delays. Users should advise the ARTCC through FSS or operation offices when there is any significant change in the proposed departure time so as to permit more efficient flow control planning. Airborne aircraft holding in the adjacent ARTCC airspace generally receive more benefit than ground delayed aircraft when increases unexpectedly develop in the quota number because the reaction time is less. For this reason, whenever operationally feasible, adjacent ARTCC's may offer airborne delay within their areas instead of ground delay.

9.6 Flights originating beyond the adjacent ARTCC areas may not have sufficient fuel to absorb the total anticipated delay while airborne. Accordingly, the concerned adjacent ARTCC may permit these flights to land in its area while retaining previously accumulated delay for the purpose of quota priority. When the amount of air traffic backlogging in an adjacent ARTCC area is approaching the saturation point, additional en route traffic will be subject to prior approval.

9.7 Generally, movement of arrival aircraft into the impacted airport terminal area will be made on the basis that those flights with the most accumulated delay, either ground, airborne, or a combination of both, normally receive priority over other traffic. This applies only to delays encountered because of the situation at the airport of intended landing.

9.8 Pilots/operators are advised to check for flow control advisories which are transmitted to flight service stations, to selected airline dispatch offices and ARTCC's.

3.17.9 ATC will not issue clearances for CVFP's when the weather is less than the published minimum.

3.17.10 ATC will clear aircraft for a CVFP after the pilot reports siting a charted landmark or a preceding aircraft. If instructed to follow a preceding aircraft, pilots are responsible for maintaining a safe approach interval and wake turbulence separation.

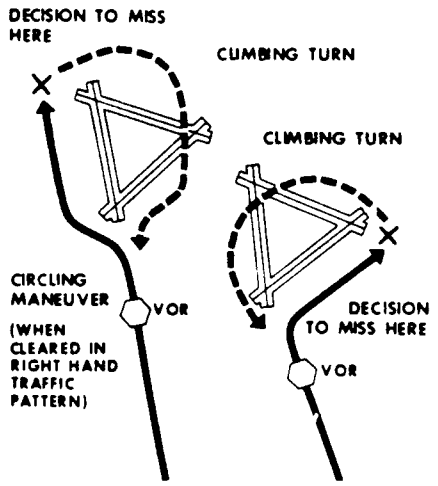
3.17.11 Pilots should advise ATC if at any point they are unable to continue an approach or lose sight of a preceding aircraft. Missed approaches will be handled as a go-around.

3.18 Missed Approach

3.18.1 When a landing cannot be accomplished, advise ATC and, upon reaching the missed approach point defined on the approach procedure chart, the pilot must comply with the missed approach instructions for the procedure being used or with an alternate missed approach procedure specified by Air Traffic Control.

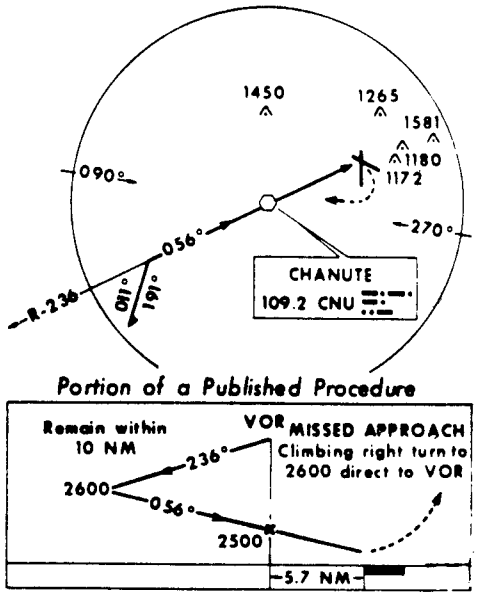
3.18.2 Protected obstacle clearance areas for missed approach are predicated on the assumption that the abort is initiated at the missed approach point not lower than the Minimum Descent Altitude (MDA) or Decision Height maneuvers. However, no consideration is given to an abnormally early turn. Therefore, when an early missed approach is executed, pilots should, unless otherwise cleared by ATC, fly the instrument approach procedure as specified on the approach plate to the missed approach point at or above the MDA or DH before executing a turning maneuver.

3.18.3 If visual reference is lost while circling to land from an instrument approach, the missed approach specified for that particular procedure must be followed (unless an alternate missed approach procedure is specified by Air Traffic control). To become established on the prescribed missed approach course, the pilot should make an initial climbing turn toward the landing runway and continue the turn until he is established on the missed approach course. Inasmuch as the circling maneuver may be accomplished in more than one direction, different patters will be required to become established on the prescribed missed approach course depending on the aircraft position at the time visual reference is lost. Adherence to the procedure, illustrated below, will assure that an aircraft will remain within the circling and missed approach obstruction clearance areas.



3.18.4 At locations where ATC Radar Service is provided the pilot should conform to radar vectors when provided by ATC in lieu of the published missed approach procedure.

3.18.5 Missed Approach Procedure Example



3.18.6 When the approach has been missed, request a clearance for specific action; i.e., to alternative airport, another approach, etc.

3.19 Overhead Approach Maneuver

3.19.1 Pilots operating in accordance with an instrument flight rules (IFR) flight plan in visual meteorological conditions (VMC) may request Air Traffic Control (ATC) authorization for an overhead maneuver. An overhead maneuver is not an instrument approach procedure. Overhead maneuver patterns are developed at airports where aircraft have an operational need to conduct the maneuver. An aircraft conducting an overhead maneuver is considered to be visual flight rules (VFR) and the IFR flight plan is cancelled when the aircraft crosses the landing threshold on the initial approach portion of the maneuver. The existence of a standard overhead maneuver pattern does not eliminate the possible requirement for an aircraft to conform to conventional rectangular patterns if an overhead maneuver cannot be approved. Aircraft operating to an airport without a functioning control tower must initiate cancellation of an IFR flight plan prior to executing the overhead maneuver. Cancellation of the IFR flight plan must be accomplished after crossing the landing threshold on the initial portion of the maneuver or after landing. Controllers may authorize an overhead maneuver and issue the following to arriving aircraft:

3.19.1.1 Pattern altitude and direction of traffic. This information may be omitted if either is standard.

PHRASEOLOGY:

PATTERN ALTITUDE (altitude). RIGHT TURNS.

3.19.1.2 Request for a report on initial approach.

PHRASEOLOGY:

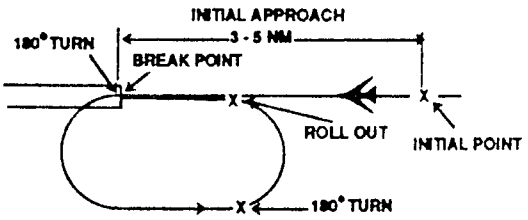
REPORT INITIAL.

3.19.1.3 "Break" information and a request for the pilot to report. The "Break Point" will be specified if non-standard. Pilots may be requested to report "break" if required for traffic or other reasons.

PHRASEOLOGY:

BREAK AT (Specified point).

REPORT BREAK.



4. DEPARTURE PROCEDURES

4.1 Pre-Taxi Clearance Procedures

4.1.1 Certain airports have established programs whereby pilots of departing IFR aircraft may elect to receive their IFR clearances before they start taxiing for takeoff. The following provisions are included in such procedures:

(1) Pilot participation is not mandatory.

(2) Participating pilots call clearance delivery/ground control not more than 10 minutes before proposed taxi time.

(3) IFR clearance (or delay information, if clearance cannot be obtained) is issued at the time of this initial call-up.

(4) When the IFR clearance is received on clearance delivery frequency, pilots call ground control when ready to taxi.

(5) Normally, pilots need not inform ground control that they have received IFR clearance on clearance delivery frequency. Certain locations may, however, require that the pilot inform ground control of a portion of his routing or that he has received his IFR clearance.

(6) If a pilot cannot establish contact on clearance delivery frequency or has not received his IFR clearance before he is ready to taxi, he contacts ground control and informs the controller accordingly.

4.1.2 Locations where these procedures are in effect are indicated in the Airport/Facility Directory.

4.2 Taxi Clearance

Pilots on IFR flight plans should communicate with the control tower on the appropriate ground control/clearance delivery frequency prior to starting engines to receive engine start time, taxi, and/or clearance information.

4.3 Departure Restrictions, Clearance Void Times, Hold for Release, and Release Times

4.3.1 ATC may assign departure restrictions, clearance void times, hold for release, and release times, when necessary, to separate departures from other traffic or to restrict or regulate the departure flow.

4.3.1.1 Clearance Void Times—A pilot may receive a clearance, when operating from an airport without a control tower, which contains a provision for the clearance to be void if not airborne by a specific time. A pilot who does not depart prior to the clearance void time must advise ATC as soon as possible of his or her intentions. ATC will normally advise the pilot of the time allotted to notify ATC that the aircraft did not depart prior to the clearance void time. This time cannot exceed 30 minutes. Failure of an aircraft to contact ATC within 30 minutes after the clearance void time will result in the aircraft being considered overdue and search and rescue procedures initiated.

NOTE 1.-Other IFR traffic for the airport where the clearance is issued is suspended until the aircraft has contacted ATC or until 30 minutes after the clearance void time or 30 minutes after the clearance release time if no clearance void time is issued.

NOTE 2.—Pilots who depart at or after their clearance void time are not afforded IFR separation and may be in violation of FAR 91.173 which requires that pilots receive an appropriate ATC clearance before operating IFR in controlled airspace.

EXAMPLE:

CLEARANCE VOID IF NOT OFF BY (clearance void time) and, if required, IF NOT OFF BY (clearance void time) ADVISE (facility) NOT LATER THAN (time) OF INTENTIONS.

4.3.1.2 Hold for Release—ATC may issue "hold for release" instructions in a clearance to delay an aircraft's departure for traffic management reasons; i.e., weather, traffic volume, etc. When ATC states in the clearance, "hold for release," the pilot may not depart until he receives a release time or is given additional instructions by ATC. In addition, ATC will include departure delay information in conjunction with "hold for release" instructions.

SEARCH AND RESCUE (SAR)

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very dangerous. At and below 200 feet AGL there are numerous power lines, antenna towers, etc., that are not marked and lighted as obstructions and therefore may not be seen in time to avoid a collision. Notices to Airmen (NOTAMS) are issued on those lighted structures experiencing temporary light outages. However, some time may pass before the FAA is notified of these outages, and the NOTAM issued, thus pilot vigilance is imperative.

8.6.2 Antenna Towers

8.6.2.1 Extreme caution should be exercised when flying less that 2,000 feet above ground level (AGL) because of numerous skeletal structures, such as radio and television antenna towers, that exceed 1,000 feet AGL with some extending higher than 2,000 feet AGL. Most skeletal structures are supported by guy wires which are very difficult to see in good weather and can be invisible at dusk or during periods of reduced visibility. These wires can extend about 1,500 feet horizontally from a structure; therefore, all skeletal structures should be avoided horizontally by at least 2,000 feet. Additionally, new towers may not be on your current chart because the information was not received prior to the printing of the chart.

8.6.3 Overhead Wires

8.6.3.1 Overhead transmission and utility lines often span approaches to runways, natural flyways such as lakes, rivers, gorges, and canyons, and cross other landmarks pilots frequently follow such as highways, railroad tracks, etc. As with antenna towers, these high voltage/power lines or the supporting structures of these lines may not always be readily visible and the wires may be virtually impossible to see under certain conditions. In some locations, the supporting structures of overhead transmission lines are equipped with unique sequence flashing white strobe light systems to indicate that there are wires between the structures. However, many power lines do not require notice to the FAA and, therefore, are not marked and/or lighted. Many of those that do require notice do not exceed 200 feet AGL or meet the Obstruction Standard of FAR part 77 and, therefore, are not marked and/or lighted. All pilots are cautioned to remain extremely vigilant for these power lines or their supporting structures when following natural flyways or during the approach and landing phase. This is particularly important for seaplane and/or float equipped aircraft when landing on, or departing from, unfamiliar lakes or rivers.

8.6.4 Other Objects/Structures

8.6.4.1 There are other objects or structures that could adversely affect your flight such as construction cranes near an airport, newly constructed buildings, new towers, etc. Many of these structures do not meet charting requirements or may not yet be charted because of the charting cycle. Some structures do not require obstruction marking and/or lighting and some may not be marked and lighted even though the FAA recommended it.

8.7 Avoid Flight Beneath Unmanned Balloons

8.7.1 The majority of unmanned free balloons currently being operated have, extended below them, either a suspension device to which the payload or instrument package is attached, or a trailing wire antenna, or both. In many instances these balloon subsystems may be invisible to the pilot until his aircraft is close to the balloon, thereby creating a potentially dangerous situation. Therefore, good judgment on the part of the pilot dictates that aircraft should remain well clear of all unmanned free balloons and flight below then should be avoided at all times.

8.7.2 Pilots are urged to report any unmanned free balloons sighted to the nearest FAA ground facility with which communication is established. Such information will assist FAA ATC facilities to identify and flight follow unmanned free balloons operating in the airspace.

9. MOUNTAIN FLYING

9.1 Your first experience of flying over mountainous terrain (particularly if most of your flight time has been over the flatlands of the midwest) could be a never-to-be forgotten nightmare if proper planning is not done and if you are not aware of the potential hazards awaiting. Those familiar section lines are not present in the mountains; those flat, level fields for forced landings are practically nonexistent; abrupt changes in wind direction and velocity occur; severe updrafts and downdrafts are common, particularly near or above abrupt changes of terrain such as cliffs or rugged areas; even the clouds look different and can build up with startling rapidity. Mountain flying need not be hazardous if you follow the recommendations below.

9.2 File a flight plan. Plan your route to avoid topography which would prevent a safe forced landing. The route should be over populated areas and well known mountain passes. Sufficient altitude should be maintained to permit gliding to a safe landing in the event of engine failure.

9.3 Don't fly a light aircraft when the winds aloft, at your proposed altitude, exceed 35 miles per hour. Expect the winds to be of much greater velocity over mountain passes than reported a few miles from them. Approach mountain passes with as much altitude as possible. Downdrafts of from 1,500 to 2,000 feet per minute are not uncommon on the leeward side.

9.4 Don't fly near or above abrupt changes in terrain. Severe turbulence can be expected, especially in high wind conditions.

9.5 Some canyons run into a dead end. Don't fly so far up a canyon that you get trapped. ALWAYS BE ABLE TO MAKE A 180 DEGREE TURN

9.6 VFR flight operations may be conducted at night in mountainous terrain with the application of sound judgment and common sense. Proper pre-flight planning, giving ample consideration to winds and weather, knowledge of the terrain and pilot experience in mountain flying are prerequisites for safety of flight. Continuous visual contact with the surface and obstructions is a major concern and flight operations under an overcast or in the vicinity of clouds should be approached with extreme caution.

9.7 When landing at a high altitude field, the same indicated airspeed should be used as at low elevation fields.*Remember:* that due to the less dense air at altitude, this same indicated airspeed actually results in a higher true airspeed, a faster landing speed, and more important, a longer landing distance. During gusty wind conditions which often prevail at high altitude fields, a power approach and power landing is recommended. Additionally, due to the faster groundspeed, your takeoff distance will increase considerably over that required at low altitudes.

9.8 *Effects of Density Altitude.* Performance figures in the aircraft owner's handbook for length of takeoff run, horsepower,

rate of climb, etc., are generally based on standard atmosphere conditions (59° F, pressure 29.92 inches of mercury) at sea level. However, inexperienced pilots as well as experienced pilots may run into trouble when they encounter an altogether different set of conditions. This is particularly true in hot weather and at higher elevations. Aircraft operations at altitudes above sea level and at higher than standard temperatures are commonplace in mountainous area. Such operations quite often result in a drastic reduction of aircraft performance capabilities because of the changing air density. Density altitude is a measure of air density. It is not to be confused with pressure altitude — true altitude or absolute altitude. It is not to be used as a height reference, but as a determining criteria in the performance capability of an aircraft. Air density decreases with altitude. As air density decreases, density altitude increases. The further effects of high temperature and high humidity are cumulative, resulting in an increasing high density altitude condition. High density altitude reduces all aircraft performance parameters. To the pilot, this means that — the normal horsepower output is reduced, propeller efficiency is reduced and a higher true airspeed is required to sustain the aircraft throughout its operating parameters. It means an increase in runway length requirements for takeoff and landings, and a decreased rate of climb. (Note. — A turbocharged aircraft engine provides some slight advantage in that it provides sea level horsepower up to a specified altitude above sea level.) An average small airplane, for example, requiring 1,000 feet for takeoff at sea level under standard atmospheric conditions will require a takeoff run of approximately 2,000 at an operational altitude of 5,000 feet.

9.8.1 *Density Altitude Advisories.* At airports with elevations of 2,000 feet and higher, control towers and flight service stations will broadcast the advisory "Check Density Altitude" when the temperature reaches a predetermined level. These advisories will be broadcast on appropriate tower frequencies or, where available ATIS. Flight Service Stations will broadcast these advisories as a part of Airport Advisory Service, and on TWEB.

9.8.2 These advisories are provided by air traffic facilities, as a reminder to pilots that high temperatures and high field elevations will cause significant changes in aircraft characteristics. The pilot retains the responsibility to compute density altitude, when appropriate, as a part of preflight duties.

Note — All flight service stations will compute the current density altitude upon request.

9.9 *Mountain Wave.* Many pilots go all their lives without understanding what a mountain wave is. Quite a few have their lives because of this lack of understanding. One need not be a licensed meteorologist to understand the mountain wave phenomenon.

9.9.1 Mountain waves occur when air is being blown over a mountain range or even the ridge of a sharp bluff area. As the air hits the upwind side of the range, it starts to climb, thus creating what is generally a smooth updraft which turns into a turbulent downdraft as the air passes the crest of the ridge. From this point, for many miles downwind, there will be a series of downdrafts and updrafts. Satellite photos of the Rockies have shown mountain waves extending as far as 700 miles downwind of the range. Along the east coast area, such photos of the Appalachian chain have picked up the mountain wave phenomenom over a hundred miles eastward. All it takes to form a mountain wave is wind blowing across the range at 15 knots or better at an intersection angle of not less than 30 degrees.

9.9.2 Pilots from flatland areas should understand a few things about mountain waves in order to stay out of trouble. Approaching a mountain range from the upwind side (generally the west), there will usually be a smooth updraft; therefore, it is not quite as dangerous an area as the lee of the range. From the leeward side, it is always a good idea to add an extra thousand feet or so of altitude because downdrafts can exceed the climb capability of the aircraft. Never expect an updraft when approaching a mountain chain from the leeward. Always be prepared to cope with a downdraft and turbulence.

9.9.3 When approaching a mountain ridge from the downwind side, it is recommended that the ridge be approached at approximately a 45° angle to the horizontal direction of the ridge. This permits a safer retreat from the ridge with less stress on the aircraft should severe turbulence and downdraft be experienced. If severe turbulence is encountered, simultaneously reduce power and adjust pitch until aircraft approaches maneuvering speed, then adjust power and trim to maintain maneuvering speed and fly away from to turbulent area.

10. SEAPLANE SAFETY

10.1 Acquiring a seaplane class rating affords access to many areas not available to landplane pilots. Adding a seaplane class rating to your pilot certificate can be relatively uncomplicated and inexpensive. However, more effort is required to become a safe, efficient, competent "bush" pilot. The natural hazards of the backwoods have given way to modern man-made hazards. Except for the far north, the available bodies of water are no longer the exclusive domain of the airman. Seaplane pilots must be vigilant for hazards such as electric power lines, power, sail and rowboats, rafts, mooring lines, water skiers, swimmers, etc.

10.2 Seaplane pilots must have a thorough understanding of the right-of-way rules as they apply to aircraft versus boats. Once a seaplane has landed on the water, it is considered a vessel, and nautical rules as well as FAR apply. Seaplane pilots are expected to know and adhere to both Inland Navigation Rules and FAR 91.115 Right of Way Rules; Water Operations which states, in part, that aircraft on the water"...shall, insofar as possible, keep clear of all vessels and avoid impeding their navigation...." In general, while on the surface with engine running, an aircraft must give way to all non-powered vessels. Additionally, good operating procedures apply. Since a seaplane in the water is not as maneuverable as one in the air, the aircraft on the water has right-of-way over one in the air, and one taking off has right-of-way over one landing. Also, as is the case with all vessels, you may be held accountable for any damage caused by your wake while taxiing.

10.3 Unless they are under Federal jurisdiction, navigable bodies of water are under the jurisdiction of the state, or in a few cases, privately owned. Unless they are specifically restricted, aircraft have as much right to operate on these bodies of water as other vessels. To avoid problems, check with Federal or local officials in advance of operating on unfamiliar waters. In addition to the agencies listed in Table 1, the nearest Flight Standards District Office can usually offer some practical suggestions as well as regulatory information. If you land on a restricted body of water because of an inflight emergency, or in ignorance of the restrictions you have violated, report as quickly as prac-

tical to the nearest local official having jurisdiction and explain your situation.

AUTHORITY TO CONSULT FOR USE OF A BODY OF WATER

Location	Authority	Contact
Wilderness Area	U.S. Department of Agriculture, Forest Service	Local forest ranger
National Forest	USDA Forest Service	Local forest ranger
National Park	U.S. Department of the Interior, National Park Service	Local park ranger
Indian Reservation	USDI, Bureau of Indian Affairs	Local Bureau office
State Park	State government or state forestry or park service	Local state aviation office for further information
Canadian National and Provincial Parks	Supervised and restricted on an individual basis from province to province and by different departments of the Canadian government; consult Canadian Flight Information Manual and/or Water Aerodrome Supplement	Park superintendent in an emergency

10.4 When operating over or into remote areas, appropriate attention should be given to survival gear. Minimum kits are recommended for summer and winter, and are required by law for flight into sparsely settled areas of Canada and Alaska. Alaska State Department of Transportation and Canadian Ministry of Transport officials can provide specific information on survival gear requirements. The kit should be assembled in one container and be easily reachable and preferably floatable.

10.5 United States Coast Guard (USCG) regulations require approved personal flotation devices (PFD) on all vessels including seaplanes operating on navigable waters of the United States. All PFDs must be in good and serviceable condition and of an appropriate size for the persons who intend to wear them. Wearable PFDs must be readily accessible and throwable devices must be immediately available for use. Seaplanes must have one USCG Type I, II, III, IV or V PFD on board for each occupant. One additional Type IV (approved device designed to be thrown to a person in the water) is also required. It is imperative that passengers be briefed on the location and proper use of available PFDs prior to leaving the dock. For additional information on approved PFDs contact your local State Boating Office or the USCG, Director of Auxiliary for your district.

11. Flight Operations in Volcanic Ash

11.1 Severe volcanic eruptions which send ash into the upper atmosphere occur somewhere around the world several times each year. Flying into a volcanic ash cloud can be exceedingly dangerous. A B747-200 lost all four engines after such an encounter and a B747-400 had the same nearly catastrophic experience. Piston-powered aircraft are less likely to lose power but severe damage is almost certain to ensue after an encounter with a volcanic ash cloud which is only a few hours old.

11.2 Most important is to avoid any encounter with volcanic ash. The ash plume may not be visible, especially in instrument conditions or at night; and even if visible, it is difficult to distinguish visually between an ash cloud and an ordinary weather cloud. Volcanic ash clouds are **not** displayed on airborne or ATC radar. The pilot must rely on reports from air traffic controllers and other pilots to determine the location of the ash cloud and use that information to remain well clear of the area. Every attempt should be made to remain on the upwind side of the volcano.

11.3 It is recommended that pilots encountering an ash cloud should immediately reduce thrust to idle (altitude permitting), and reverse course in order to escape from the cloud. Ash clouds may extend for hundreds of miles and pilots should not attempt to fly through or climb out of the cloud. In addition, the following procedures are recommended:

a. Disengage the autothrottle if engaged. This will prevent the autothrottle from increasing engine thrust;

b. Turn on continuous ignition;

c. Turn on all accessory airbleeds including all air conditioning packs, nacelles, and wing anti-ice. This will provide an additional engine stall margin by reducing engine pressure.

11.4 The following has been reported by flightcrews who have experienced encounters with volcanic dust clouds:

a. Smoke or dust appearing in the cockpit;

b. An acrid odor similar to electrical smoke;

c. Multiple engine malfunctions, such as compressor stalls, increasing EGT, torching from tailpipe, and flameouts;

d. At night, St. Elmo's fire or other static discharges accompanied by a bright orange glow in the engine inlets;

e. A fire warning in the forward cargo area.

11.5 It may become necessary to shut down and then restart engines to prevent exceeding EGT limits. Volcanic ash may block the pitot system and result in unreliable airspeed indications.

11.6 If you see a volcanic eruption and have not been previously notified of it, you may have been the first person to observe it. In this case, immediately contact ATC and alert them to the existence of the eruption. Do not become unnecessarily alarmed if there is merely steam or very low-level eruptions of ash.

12. EMERGENCY AIRBORNE INSPECTION OF OTHER AIRCRAFT

12.1 Providing airborne assistance to another aircraft may involve formation flying. Most pilots receive little if any formal training or instruction in formation flying. Formation flying after a face to face planning session is difficult enough. Formation flying without sufficient time to plan (i.e., an emergency situation), coupled with the stress involved in a perceived emergency can be hazardous.

12.2 The pilot in command of the aircraft experiencing the problem/emergency must take the lead in coordinating the airborne intercept and inspection and take into account the unique flight characteristics and differences of the category(s) of aircraft involved.

12.3 Some of the safety considerations are:

a. Direction and speed of intercept;

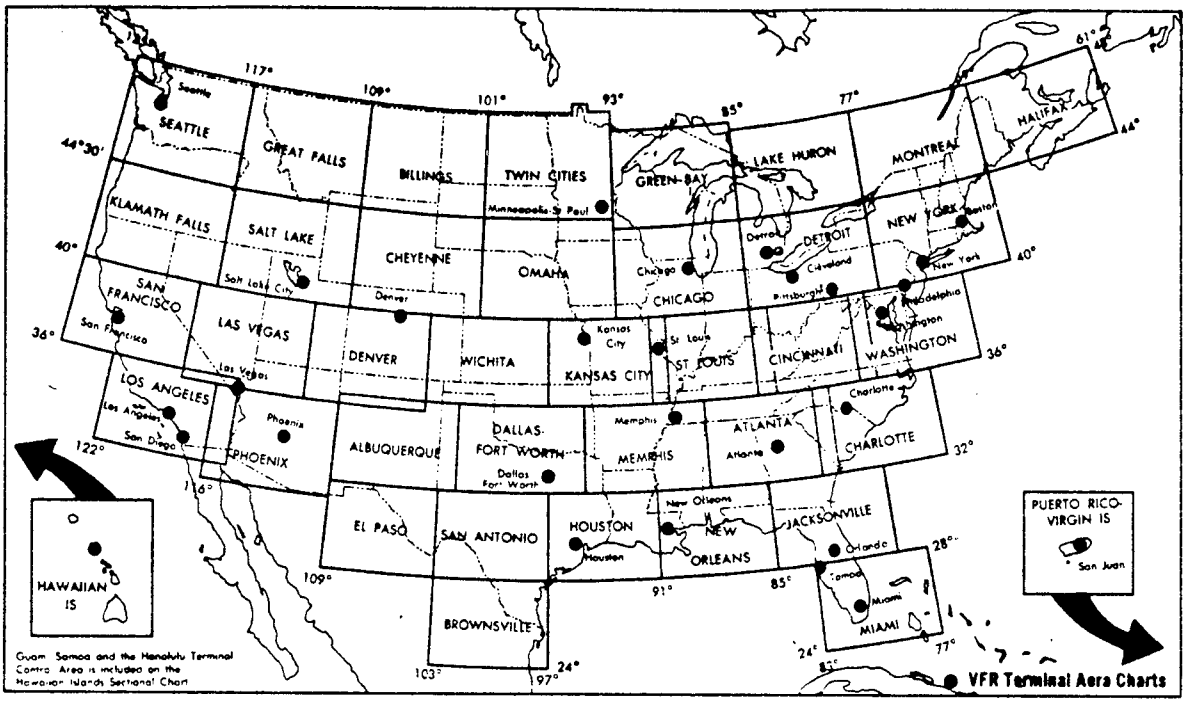
b. Minimum separation distance;

c. Communications requirements, lost communication procedures; and

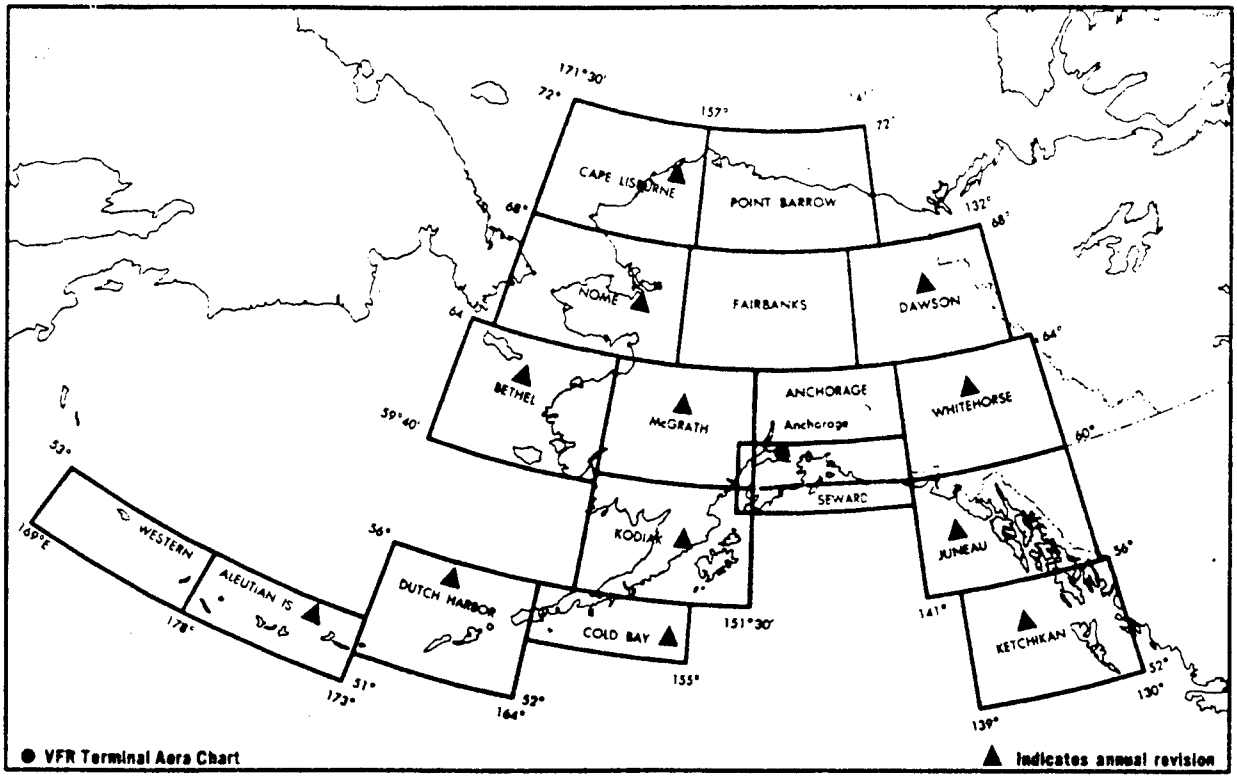
d. Emergency actions to terminate intercept.

12.4 Close proximity, in-flight inspection of another aircraft is uniquely hazardous. The pilot in command of the aircraft experiencing the problem/emergency must not relinquish his/her control of the situation and jeopardize the safety of his/her aircraft. The maneuver must be accomplished with minimum risk to both aircraft.

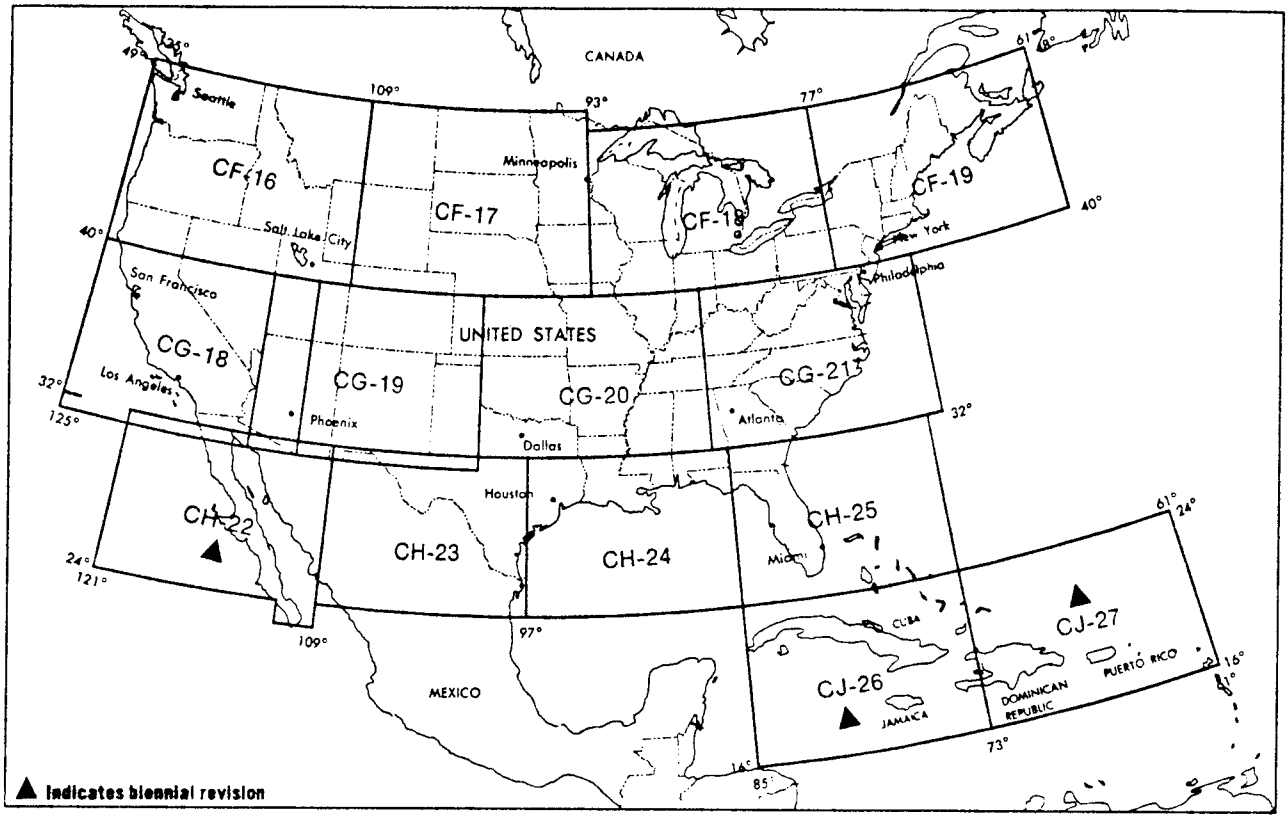
Sectional and VFR Terminal Area Charts for the Conterminous United States, Hawaiian Islands, Puerto Rico and the Virgin Islands



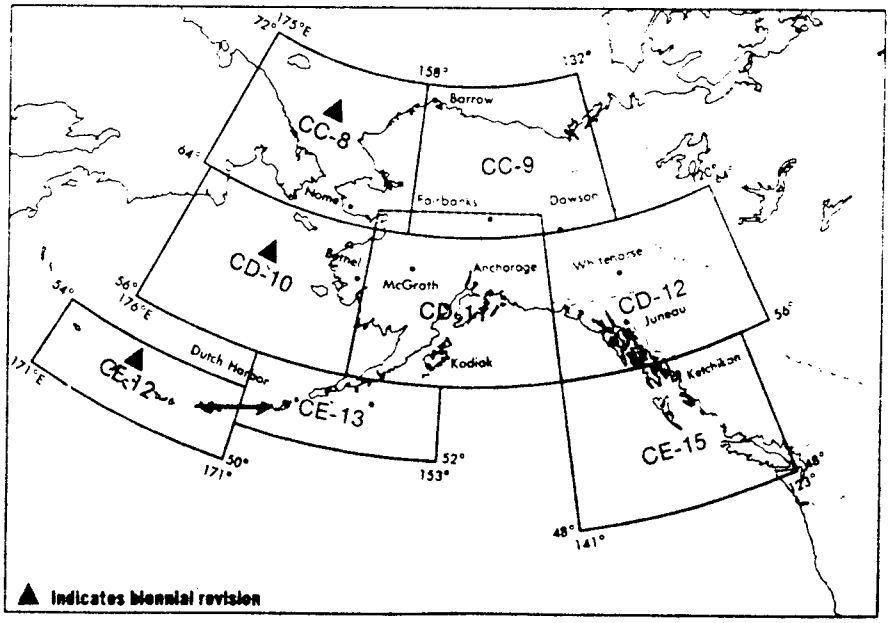
Sectional and VFR Terminal Area Charts for Alaska



World Aeronautical Charts for the Conterminous United States, Mexico, and the Caribbean Areas



World Aeronautical Charts for Alaska



ANNEX 2 — RULES OF THE AIR

ICAO REF:	
Chapter 1	Definitions
Airport Traffic Area	Airspace within a horizontal radius of 5 statute miles from the geographical center of any airport at which a control tower is operating, extending from the surface up to, but not including, 3,000 feet above the elevation of the airport.
Danger Area	The term **Danger Area** is not used within the U.S. or any of its possessions or territories.
Estimated Off-Block Time	The U.S. uses the term **Estimated Departure Time** for domestic operations.
Expected Approach Time	The U.S. uses the term **Expect Further Clearance** the time a pilot can expect to receive clearance beyond a clearance limit.
Instrument Meteorological Conditions	The U.S. air traffic service units use the phrase **IFR Conditions.**
Repetitive Flight Plan (RPL)	The U.S. uses the term **Stored Flight Flan** for domestic operations.
Total Estimated Elapsed Time	The U.S. uses the term **Estimated Time En Route** for domestic operations.
Visual Meteorological Conditions	U.S. air traffic service units use the phrase **VFR Conditions.**
Chapter 2	Applicability Of The Rules Of The Air
2.5	Except in an emergency, no pilot of a civil aircraft may allow a person who appears to be intoxicated or who demonstrates by manner or physical indications that the individual is under the influence of drugs (except a medical patient under proper care), to be carried in that aircraft.
Chapter 3	General Rules
3.1.1	**In addition,** aircraft operations other than for the purpose of air navigation. No person may operate an aircraft other than for the purpose of air navigation, on any part of the surface of an airport used by aircraft for air commerce (including areas used by those aircraft for receiving or discharging persons or cargo), in a careless or reckless manner as to endanger the life or property of another.

ICAO REF:	
3.2.1.2	**In addition,** aircraft shall not be flown in formation flights when passengers are carried for hire.
3.2.3.2 (d)	All aircraft on the movement area of an aerodrome whose engines are running shall display lights which indicate that fact from sunrise to sunset.
3.2.5	Unless otherwise authorized or required by ATC, no person may operate an aircraft within an airport traffic area except for the purpose of landing at, or taking off, from an airport within that area **In addition,** in the case of a helicopter approaching to land, avoid the flow of fixed-wing aircraft. **In addition,** no person may, within an airport traffic area operate an aircraft to, from, or on an airport having a control tower operated by the United States unless two-way radio communications are maintained between that aircraft and the control tower.
3.3.1.2.1 (d)	Requirements pertaining to filing flight plans for flights operating across United States borders and for identification purposes are described in FAR 91 and Part 99 of the Federal Aviation Regulation.
3.3.1.2.2	The United States requires that domestic flight plans be submitted at least thirty minutes before departure. For international flights, the United States recommends that they be transmitted so that they are received by ATC authorities in each FIR to be entered, at least two hours prior to entry, unless otherwise provided in that State's requirements.
3.6.2.4	When meteorological conditions fall below the minimum specified for enroute VFR flights, the pilot of the aircraft shall not continue his flight in such conditions, except in emergency, beyond the extent necessary to return to his departure point or to the nearest suitable landing point.

ICAO REF:

Chapter 4 Visual Flight Rules

4.1 (a) Except as otherwise authorized by the appropriate air traffic control unit, for special VFR flights within control zones, no person may operate an aircraft under VFR when the flight visibility is less, or at a distance from clouds that is less, than that prescribed for the corresponding altitude in the following table:

BASIC VFR WEATHER MINIMUMS

Altitude	Flight Visibility	Distance from Clouds
1,200 feet or less above the surface—		
Within controlled airspace:	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
Outside controlled airspace: Day: (except as provided in section 91.155(b))	1 statue mile	Clear of clouds
Night: (except as provided in section 91.155(b))	3 statue miles	500 feet below 1,000 feet above 2,000 feet horizontal
More than 1,200 feet above the surface but less than 10,000 feet MSL—		
Within controlled airspace:	3 statue miles	500 feet below 1,000 feet above 2,000 feet horizontal
Outside controlled airspace: Day:	1 statute mile	500 feet below 1,000 feet above 2,000 feet horizontal
Night:	3 statue miles	500 feet below 1,000 feet above 2,000 feet horizontal
More than 1,200 feet above the surface and at or above 10,000 feet MSL	5 statute miles	1,000 feet below 1,000 feet above 1 mile horizontal

The following operations may be conducted outside of controlled airspace below 1,200 feet above the surface: 1. **Helicopter.** When the visibility is less than one mile during day hours or less than 3 miles during night hours, a helicopter may be operated clear of clouds if operated at a speed that allows the pilot adequate opportunity to see any air traffic or obstruction in time to avoid a collision. 2. **Airplane.** Wen the visibility is less than 3 miles but not less than 1 mile during night hours, an airplane may be operated clear of clouds if operated in an airport traffic pattern within one-half mile of the runway.

ICAO REF:

4.1 (b) Except as provided in paragraph 4.2 no person may operate an aircraft, under VFR, within a control zone beneath the ceiling when the ceiling is less than 1,000 feet.

ICAO REF:

4.1 (c) Except as provided in paragraph 4.2 no person may take off or land an aircraft, or enter the traffic pattern of an airport, under VFR, within a control zone:

(1) Unless ground visibility at that airport is at least 3 statute miles; or

(2) If ground visibility is not reported at that airport, unless flight visibility during landing or takeoff, or while operating in the traffic pattern, is at least 3 statute miles.

4.2 (a) When an appropriate ATC clearance has been received, the special weather minimums in this section apply to the operation of an aircraft in a control zone under VFR.

(l) No person may operate an aircraft in a control zone under VFR except clear of clouds.

(2) No person may operate an aircraft (other than a helicopter) in a control zone under VFR unless flight visibility is at least l statute mile.

(3) No person may take off or land an aircraft (other than a helicopter) at any airport in a control zone under VFR

(i) Unless ground visibility at that airport is at least l statute mile; or

(ii) If ground visibility is not reported at that airport, unless flight visibility during landing or takeoff is at least l statute mile

NOTE: The U.S. Federal Aviation Airspace Reclassification will become effective **September 16, 1993.** The text and table in paragraph **4.1 and 4.2** was revised as follows:

4.1 (a) Except as otherwise authorized by the appropriate air traffic control unit for special VFR flights within control zones, no person may operate an aircraft under VFR when the flight visibility is less, or at a distance from clouds that is less than that prescribed for the corresponding altitude and class of airspace in Table 2:

TABLE 2

Airspace	Flight Visibility	Distance from Clouds
Class A	Not Applicable	Not Applicable
Class B	3 statue miles	Clear of Clouds
Class C	3 statue miles	500 feet below 1,000 feet above 2,000 feet horizontal
Class D	3 statue miles	500 feet below 1,000 feet above 2,000 feet horizontal
Class E.		
Less than 10,000 feet MSL	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
At or above 10,000 feet MSL	5 statue miles	1,000 feet below 1,000 feet above 1 statute mile horizontal
Class G.		
1,200 feet or less above the surface (regardless of MSL altitude)..		
Day, except as provided in section 91.155(b)..	1 statute mile	Clear of clouds
Night, except as provided in section 91.155(b)..	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
More than 1,200 feet above the surface but less than 10,000 feet MSL..		
Day	1 statute mile	500 feet below 1,000 feet above 2,000 feet horizontal
Night	3 statute mile	500 feet below 1,000 feet above 2,000 feet horizontal
More than 1,200 feet above the surface and at or above 10,000 feet MSL..	5 statute miles	1000 feet below 1,000 feet above 1 statute mile horizontal

ICAO REF:

4.1 (b) **Class G Airspace:** Notwithstanding the provisions of paragraph (a) of this section, the following operations may be conducted in class G airspace below 1,200 feet above the surface:

(1) **Helicopter.** A helicopter may be operated clear of clouds if operated at a speed that allows the pilot adequate opportunity to see any air traffic or obstruction in time to avoid collision.

(2) **Airplane.** When the visibility is less than 3 statute miles but not less than 1 statue mile during night hours, an airplane may be operated clear of clouds if operated in an airport traffic pattern within one-half mile of the runway.

4.1 (c) Except as provided in 4.2, no person may operate an aircraft under VFR within the later boundaries of the surface areas of Class B, Class C, Class D, or Class E airspace designated for an airport when the ceiling is less than 1,000 feet.

ICAO REF:

4.1 (d) Except as provided in 4.2, no person may take off or land an aircraft, or enter the traffic pattern area of an airport under VFR, within the lateral boundaries of the surface area of Class B, Class C, Class D, or Class E airspace designed for an airport -

(1) unless ground visibility at that airport is at least 3 statue miles; or

(2) if ground visibility is not reported at that airport, unless flight visibility during landing or takeoff, or while operating in the traffic pattern is at least 3 statue miles.

4.2 (a) When an appropriate ATC clearance has been received, the special weather minimums in this section apply to the operation of an aircraft in a control zone under VFR.

(1) No person may operate an aircraft in a control zone under VFR except clear of clouds;

(2) No person may operate an aircraft (other than a helicopter) in a control zone under VFR unless flight visibility is at least 1 statute mile;

(3) No person may take off or land an aircraft (other than a helicopter) at any airport in a control zone under VFR -

(i) unless ground visibility at that airport is at least 1 statute mile; or

(ii) if ground visibility is not reported at that airport, unless flight visibility during landing or takeoff is at least 1 statute mile.

4.4 In the United States VFR flight is not permitted within positive control areas designated in FAR Part 71 unless otherwise authorized by ATC.

4.5 **In addition:** anywhere, an altitude allowing, if a power unit fails, an emergency landing without due hazard to persons or property on the surface.

4.6 **In addition,** grid tracks are not used to determine cruising altitudes in polar areas. True tracks are used to determine cruising levels above FL 230 in the area north of Alaska bounded by the true North Pole to 72-00-00N, 141-00-00W to 72-00-00N, 158-00-00W to 68-00-00N, 168-58-23W to point of beginning. The United States has named this area the Anchorage Arctic CTA/FIR for national reference purposes.

Chapter 5 Instrument Flight Rules

5.2.2 See difference under paragraph 4.6

5.3.1 See difference under paragraph 4.6

ICAO REF:

Further differences which exist by virtue of the fact that the Annex contains no comparable standards for the undermentioned national regulations.

1.0 The regulations covering the selection and use of alternate airports in respect to ceiling and visibility minima, require that:

1.1 Unless otherwise authorized by the Administrator, no person may include an alternate airport in an IFR flight plan unless current weather forecasts indicate that, at the estimated time of arrival at the alternate airport, the ceiling and visibility at that airport will be at or above the alternate airport weather minima;

2.0 **Operation under IFR in controlled airspace; malfunction reports.**

2.1 The pilot in command of each aircraft operated in controlled airspace under IFR shall report as soon as practical to ATC any malfunctions of navigational, approach, or communication equipment occurring in flight;

2.2 In each report the pilot in command shall include:

(1) Aircraft Identification;

(2) Equipment affected;

(3) Degree to which the capability of the pilot to operate under IFR in the ATC system is impaired; and

(4) Nature and extent of assistance desired from ATC.

3.0 When an aircraft has been cleared to maintain "VFR conditions On Top", the pilot is responsible to fly at an appropriate VFR altitude, comply with VFR visibility and distance from cloud criteria, and to be vigilant so as to see and avoid other aircraft.

4.0 Aircraft Speed

4.1 Unless otherwise authorized by the Administrator, no person may operate an aircraft below 10,000 feet MSL at an indicated airspeed of more than 250 knots (288 m.p.h.).

4.2 Unless otherwise authorized or required by ATC, no person may operate an aircraft within an airport traffic area at an indicated airspeed of more than 200 knots (230 m.p.h.). This paragraph (4.2) does not apply to operations within an terminal control area. Such operations shall comply with paragraph (4.1) of this section.

ICAO REF:

4.3 No person may operate an aircraft in the airspace underlying a terminal control area, or in a VFR corridor designated through a terminal control area, at an indicated airspeed of mole than 200 knots (230 m.p.h.).

4.4 If the minimum safe airspeed for any operation is greater than the maximum speed prescribed in this section, the aircraft may be operated at that minimum speed.

5.0 Operating Rules and pilot and equipment requirements for flight in terminal control areas.

5.1 Operating Rules. No person may operate an aircraft within a terminal control area except in compliance with the following rules:

(a) No person may operate an aircraft within a terminal control area unless that person has received an appropriate authorization from ATC prior to operation of that aircraft in that area;

(b) Unless otherwise authorized by ATC, each person operating a large turbine engine-powered airplane to or from a primary airport shall operate at or above the designated floors while within the lateral limits of the terminal control area.

(c) Any person conducting pilot training operations at an airport within a terminal control area shall comply with any procedures established by ATC for such operations in terminal control area.

5.2 Pilot Requirements. No person may take off or land a civil aircraft at an airport within a terminal control area or operate a civil aircraft within a terminal control area unless:

(a) The pilot in command holds at least a private pilot certificate; or

(b) the aircraft is operated by a student pilot who has met the requirements (FAR 61.95).

5.3 Communications and navigation requirements. Unless otherwise authorized by ATC, no person may operate an aircraft within a terminal control area unless that aircraft is equipped with -

(a) For **IFR** operations. An operable VOR or TACAN receiver, and

(b) For **all** operations. An operable two-way radio capable of communications with ATC on appropriate frequencies for that terminal control area.

ICAO REF:

5.4 Transponder Requirements. No person may operate an aircraft in a terminal control area unless the aircraft is equipped with the applicable operating transponder and automatic altitude reporting equipment.

6.0 Operating Rules and pilot and equipment requirements for in airport radar service areas.

6.1 General. For the purpose of this section, the primary airport is the airport designated in FAR Part 71, for which the airport radar service area is designated. A satellite airport is any other airport within the airport radar service area.

6.2 Deviations. An operator may deviate from any provisions of this section under the provisions of an ATC authorization issued by the ATC facility giving jurisdiction of the airport radar service area. ATC may authorize a deviation on a continuing basis or for an individual flight, as appropriate.

6.3 Arrivals and Overflights. No person may operate an aircraft in an airport radar service area unless two-way radio communication is established with the ATC facility having jurisdiction over the airport radar service area prior to entering that area and is thereafter maintained with the ATC facility having jurisdiction over the airport radar service area while within that area

6.4 Departures. No person may operate an aircraft within an airport radar service area except as follows:

(a) From the primary airport or satellite airport with an operating control tower, unless two-way radio communications is established and maintained with the control tower, and thereafter as instructed by ATC while operating in the airport radar service area.

(b) From a satellite airport without an operating control tower, unless two way radio communication is established as soon as practical after departing and thereafter maintained with the ATC facility having jurisdiction over the airport radar service area.

6.5 Traffic patterns. No person may take off or land an aircraft at a satellite airport within an airport radar service area except in compliance with FAA arrival and departure traffic patterns.

ICAO REF:

6.6 Equipment requirements. Unless otherwise authorized by the ATC facility having jurisdiction over the airport radar service area, no person may operate an aircraft within an airport radar service area unless that aircraft is equipped with the applicable equipment specified in FAR Part 91.215.

7.0 Except for persons operating gliders below the floor of the positive control area, no person may operate an aircraft in controlled airspace of the 48 contiguous States and the District of Columbia above 10,000 ft MSL, excluding that airspace at and below 2,500 feet AGL, unless that aircraft is equipped with an operable radar beacon transponder having at least a Mode 3/A 4096-code capability, replying to Mode 3/A interrogation with the code specified by ATC, and automatic altitude reporting equipment having a Mode C capability that automatically replies to Mode C interrogations by transmitting pressure altitude information in 100-foot increments.

8.0 Compliance with ATC clearances and instructions

(a) When an ATC clearance has been obtained, no pilot in command may deviate from that clearance, except in an emergency, unless an amended clearance is obtained. A pilot in command may cancel an IFR flight plan if that pilot is operating in VFR weather conditions outside of positive controlled airspace. If a pilot is uncertain of the meaning of an ATC clearance, the pilot shall immediately request clarification from ATC.

(b) Except in an emergency, no person may operate an aircraft contrary to an ATC instruction in an area in which air traffic control is exercised.

(c) Each pilot in command who, in an emergency, deviates from an ATC clearance or instruction shall notify ATC of that deviation as soon as possible.

(d) Each pilot in command who is given priority by ATC in an emergency, shall submit a detailed report of that emergency within 48 hours to the manager of that ATC facility, if requested by ATC.

ICAO REF:	
	(e) Unless otherwise authorized by ATC, no person operating an aircraft may operate that aircraft according to any clearance or instruction that has been issued to the pilot of another aircraft for radar air traffic control purposes.
Appendix 1	
4.1.1	The flashing white signal to aircraft in flight, meaning "Land at this aerodrome and proceed to apron" is not used in the States.

ICAO REF:	
	In addition, the alternating red and green signal to aircraft on the ground or in flight means: Exercise extreme caution.

ANNEX 3 — METEOROLOGICAL SERVICE FOR INTERNATIONAL AIR NAVIGATION

UNITED STATES	
Chapter 3	
3.2.1 (b) and (c)	The capability to comply is being developed. Total compliance may be expected by 1996, however, some global significant weather chart data will be generated prior to 1996 for regional assessment. Status reports will be available through the secretary of the WAFS Study Group.
3.4.2 (h)	The U.S. relies mainly on information derived from satellite, aircraft and radar observations.
Chapter 4	
4.3.3* (a), (b), (c), (d)	Practices require special observations due to changes in surface winds only when: (a) the average two minute wind speed suddenly increases to twice or more than twice the currently reported two minute wind speed and exceeds 25 knots; or (b) the wind shifts (a term applied to a change in wind direction of 45 degrees or more which takes place in less than 15 minutes). In addition, U.S. practices are to report any observation of wind variation when the wind direction varies by more than 60 degrees and wind speed is more than 10 knots.
4.3.3 (e)*	Practices require special observations to be taken due to changes in visibility when prevailing visibility as reported in the body of the report decreases to less than, or if below, increases to equal or exceed: (a) 3 statute miles; (b) 2 statute miles; (c) 1 1/2 statute miles; (d) 1 statute miles; or (e) All nationally published landing minimums are applicable to the airport. These are listed in the National Ocean Survey (NOS) Instrument Approach Procedures Charts or Department of Defense Flight Information Publications (DOD FLIPS).

UNITED STATES—Continued	
	(Prevailing visibility is defined as the greatest visibility equaled or exceeded throughout as least half the horizon circle which need not necessarily be continuous.)
4.3.3 (f)*	Practices do n require special observations due to changes in RVR.
4.3.3 (g)*	Practices do not require special observations for the beginning, ending or change in intensity of: (a) moderate or heavy: rain; snow; ice pellets (except at stations where observations are made manually); snow pellets; rain and snow mixed; (b) low drifting dust, sand or snow; (c) blowing dust, sand or snow (including snowstorm); (d) duststorm; (e) sandstorm; or (f) squall. (special observations will, however, be made if visibility criteria are met as indicated above, relative to paragraph 4.3.3 (e).)
4.3.3 (h)*	The U.S. does not report special observations for 200 feet but does report for all nationally published landing minimums applicable to the airport. These are listed in the National Ocean Survey (NOS) Instrument Approach Procedures Charts or Department of Defense Flight Information Publications (DOD FLIPS).
4.5.4	Surface wind indicators from all sensors are not located in aerodrome meteorological offices.
4.7.14*	The values, reported in feet (FT), of its reading are based on light setting 5 (highest available) for the designated instrument runway. RVR tendency is not reported.
4.9.5*	The U.S. reports all cloud layers up to and including the lowest overcast layer. Cloud layer amounts are a summation of layers at or below a given level (cumulative cloud amounts).
4.13.2	The U.S. does not use the term CAVOK in meteorological reports.
4.15	The U.S. relies mainly on information derived from satellite, aircraft and radar observations.

UNITED STATES—Continued

Chapter 6	
6.2.5 (b)* 6.2.17*	The U.S. uses statute miles (SM) for visibility forecasts.
6.2.5 (h)* 6.2.17* 6.2.19*	The U.S. does not use the term CAVOK in meteorological forecasts.

*Recommended Practice.

ANNEX 4 — AERONAUTICAL CHARTS

UNITED STATES

Chapter 1	Definitions
Air Taxiway	The U.S. does not depict defined surfaces for air taxiing of helicopters.
Danger Area	The term "Danger area" will not be used in reference to areas within the United States or in any of its possessions or territories.
FATO (Final Approach and Takeoff Area)	The U.S. does not depict Final Approach and Takeoff Areas (FATOs).
Helicopter Stand	The U.S. does not use this term.
Prohibited Area Restricted Area	The United States will employ the terms "Restricted area" and "Prohibited area" substantially in accordance with the definitions established and, additionally, will use the following terms: "Alert area" — Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity — neither of which is hazardous to aircraft. "Controlled firing area" — Airspace wherein activities are conducted under conditions so controlled as to eliminate the hazards to nonparticipating aircraft and to ensure the safety of persons and property on the ground. "Warning area" — Airspace which may contain hazards to nonparticipating aircraft in international airspace. "Maneuvering area" — This term is not used by the United States. "Military Operations Area (MOA)" — An MOA is an airspace assignment of defined vertical and lateral dimensions established outside positive control areas to separate/segregate certain military activities from IFR traffic and to identify for VFR traffic where these activities are conducted. "Movement area" — Movement area is defined by the United States as "The runways, taxiways, and other areas of an airport which are utilized for taxiing, take-off and landing of aircraft, exclusive of loading ramp and parking areas."
TLOF (Touchdown And Lift-off Area)	The U.S. does not use this term.

UNITED STATES—Continued

Chapter 2	
2.1	The title of charts produced by the United States are not those provided for in Annex 4
2.2.1	The marginal note layouts, in some cases, differ from those set forth in Appendices 1, 5 and 6.
2.4.1	Visibility distances are expressed in statute miles and fractions thereof.
2.4.4	Conversion scale (meters/feet) is not shown on Radio Navigation Charts.
Chapter 3	
3.1	The United States produces an Aerodrome Obstruction Chart which covers the basic requirements called for by Aerodrome Obstruction Chart — ICAO Type A.
Chapter 4	
4.1	The United States produces an Aerodrome Obstruction Chart which covers the basic requirements called for by Aerodrome Obstruction Chart — ICAO Type B.
Chapter 5	
5.8.1	The navigation grid on United States Aircraft Position Chart 3097 comprises lines parallel to 54° West Meridian and the navigation grid on United States Aircraft Position Chart 3096 comprises lines parallel to 92° West Meridian. These changes to the ICAO Standard were made to provide navigation grid lines vertical to a great circle projection base.
Chapter 6	
6.9.1.1	Only outbound magnetic bearings from VOR facilities and inbound magnetic bearings to low/medium frequency radio navigation facilities are shown.
Chapter 9	
9.3.1	Charts covering continental United States between latitudes 24° and 52° North are based on standard parallels at 33° and 45° and between latitudes 52° and 72° North on standard parallels at 55° and 65°.

UNITED STATES—Continued

9.4.1	The United States uses a sheet numbering system which differs from the index in Appendix 7.
9.8.3.2*	The elevation of the highest point on any sheet is not always cleared of hypsometric tinting.
9.10.1	Heliports are not shown.
Chapter 10	
10.8.3.2*	The elevation of the highest point on any sheet is not always cleared of hypsometric tinting.
Chapter 12	
12.2.1	Stopways are not indicated.
12.5.5.2.1	The datum (MSL) is stated in the Instrument Approach Chart legend, not on the chart.
12.6.2	Runway threshold elevations are not shown.
Chapter 13	
13.6.1.d Surface type for heliports.	The U.S. does not show "type of surface for heliports".
13.6.2 Elevated helidecks etc.	The U.S. does not show "surface level, elevated or helidecks".
Appendix 2	
No. 21	Tidal flats are shown in brown stipple over the blue open water tint.
No. 45	Rocks awash are shown by a six-armed symbol as adopted by the International Hydrographic Bureau.
No. 54, 61	Spaces between sides of bridge and road or railroad symbols are filled solid.
No. 70	Oil or gas fields are shown with an oil well derrick symbol.
No. 77	Ruins are shown by a solid square, properly annotated.
No. 94	The runway surface indicator (letter H) and the lighting indicator (letter L) are not normally used on high altitude Radio Navigation Charts. Only those aerodromes with a minimum of 5,000 feet hard-surfaced runways are shown.

UNITED STATES—Continued

	The letter H is not used on low altitude Radio Navigation Charts. All aerodromes depicted have hard-surfaced runways, excepting that where the letter "S" follows the runway length, the runway surface is soft.
	On Visual Navigation Charts of the 1:500 000 scale, a miniature runway layout depiction indicates aerodromes with hard-surfaced runways at least 1,500 feet long.
No. 110	Aerodrome traffic zones are termed "Airport traffic areas" in United States usage. These are all of standard dimensions. Limits are not shown, but aerodromes at which airport traffic areas have been established are indicated by a colour coded aerodrome symbol.
No. 113	Limits of advisory areas are shown on Radio Navigation Charts with a crenellated line. This depiction is indicated in the legend as the border of an Air Route Traffic Control Center (ARTCC).
No. 116	The nomenclature "non compulsory" is used instead of "on request" for appropriate position reporting points.
No. 127	Isogonic lines are shown on Radio Navigation Charts only as short sections of continuous lines extending inward from the neat lines.

*Recommended Practice.

ANNEX 11 — AIR TRAFFIC SERVICES

ICAO REF:	
Chapter 1	
Controlled Airspace (Instrument restricted) Controlled Airspace (Instrument/ Visual) Controlled Airspace (Visual exempted)	These terms are not used in the designation of U.S. airspace: however, only IFR flights are permitted in airspace designated "Positive Control Area" and "Positive Control Route Segments." Only IFR and controlled VFR flights are permitted within "Terminal Control Areas." In all other controlled airspace, both IFR and VFR flights are permitted but VFR flights are not subject to control. (It should be noted that the term "Terminal Control Area" as used in the U.S. is more restrictive than that specified by ICAO. Flights within TCAs in the U.S. must be operated in accord with the provisions of U.S. FAR 91.90.)
Chapter 2	
2.5.2.2.1.1	See difference relating to Controlled Airspace under Chapter 1.
2.9 2.11 Appendix 1 Appendix 2	Converting the present United States system for identifying ATS routes and significant points to conform to the provisions of amended paragraphs 2.9 — 2.9.2, 2.11 — 2.11.3, Appendix 1 and Appendix 2 is an effort of considerable magnitude and complexity. The United States has an ongoing program to accomplish the conversion but it is estimated that a period of two to five years will be required for full compliance.

ICAO REF:	
Chapter 3	
3.1.1.2 and 3.3.3.(d)	See difference relating to Controlled Airspace under Chapter 1.
3.3.3 Exception Clause	Clearances may be issued to conduct flight in VFR conditions without a pilot request if the clearance would result in noise abatement benefits or when a pilot conducts a practice instrument approach.
Chapter 4	
4.2.2(b),	No provision is made for the issuance of collision hazard information to flights operating outside of controlled airspace.
4.3.4.4(h) 4.3.4.8	The U.S. requires that the current altimeter setting be included in the ATIS broadcast. Information contained in a current ATIS broadcast, the receipt of which has been acknowledge by an aircraft, is not included in a directed transmission to the aircraft unless requested by the pilot.
4.3.5 4.3.6 4.3.7	The order in which information is listed in ATIS broadcast messages is not mandated and certain elements are regarded as optional.
Appendix 1	
2.2.1	Routes designated to serve aircraft operating from 18,000 MSL up to and including FL450 are referred to as "Jet Routes" and are designated with the letter "J" followed by a number of up to three digits.